

638670

SAFETY COMPLIANCE TESTING FOR FMVSS 121

Air Brake Systems

Vehicle: 2006 Mack Vision CXN613 6x4 Truck Tractor

Mack Trucks, Inc.

Report #: 121V-TRC-02-001

NHTSA #: C60700

TRC Test #: 20040769/1214

Transportation Research Center Inc.

P. O. Box B-67

East Liberty, Ohio 43319-0367



October 2005

Final Report

U.S. Department of Transportation

National Highway Traffic Safety Administration

Safety Assurance

Office of Vehicle Safety Compliance

400 Seventh Street, SW

Room 6111 (NVS-220)

Washington, DC 20590

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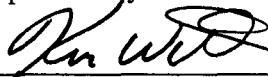
Prepared By:



Brad Bean, Project Engineer
Durability and Dynamics Engineering

11/16/2005
Date

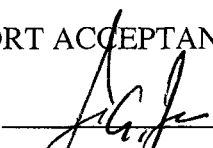
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Section 1.0

Purpose of Compliance Test

Purpose

Transportation Research Center Inc. (TRC Inc.) conducted this program for the National Highway Traffic Safety Administration (NHTSA). The purpose of this test was to determine if the subject vehicle, a 2006 Mack Vision Truck Tractor, meets the performance requirements of FMVSS 121, "Air Brake Systems."

Test Procedure

This test was conducted in accordance with NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-121V-04. Data was obtained relative to FMVSS 121, "Air Brake Systems". The test sequence was performed as follows:

1. Burnish GVWR
2. Brake Actuation and Release Timing
3. Parking Brake Chamber Application Pressure Determination
4. Stability & Control GVWR
5. Stability & Control LLVW
6. Service Brake Stops GVWR
7. Park Brake – Grade Holding GVWR
8. Service Brake Stops LLVW
9. Emergency Brake – Primary Reservoir Failed LLVW
10. Emergency Brake – Secondary Reservoir Failed LLVW
11. Emergency Brake – Primary Control Line Failed LLVW
12. Park Brake – Grade Holding LLVW

The vehicle information is summarized in Section 2.0. The test data summary is located in Section 3.0, the test data is located in Section 4.0, and the test summary is located in Section 5.0. Appendix A contains the still photographic prints. Appendix B lists the test data in Report Generator format.

Section 2.0

Vehicle Information

Vehicle Information

The completed test vehicle is a 2006 Mack Vision truck tractor. The test vehicle is a 6x4 with a wheelbase of 191 inches. The Gross Vehicle Weight Rating (GVWR) is 52,000 pounds, and the test vehicle is equipped with a Bendix 4S/4M anti-lock brake system.

Section 3.0

Test Data Summary

Test Data Summary

Table 1

Summary of Data for Laboratory Test "Application & Release Times"

Average Times in Seconds	Application Max. Allowable 0.45			Release Max. Allowable 0.55			50 cu. in. Reservoir	
	Right Steer	Int.	Left Rear	Right Steer	Int.	Left Rear	Apply Max. 0.45	Release Max. 0.55
Full System Operating	.288	.351	.413	.329	.413	.453	N/A	N/A
ABS Main Power Failed	.316	.377	.377	.351	.437	.476	N/A	N/A
ABS Wheel Sensor Failed (Open)	.290	.358	.360	.344	.428	.465	N/A	N/A
ABS Wheel Sensor Failed (Short)	.288	.357	.359	.347	.431	.467	N/A	N/A

Table 2

Data Summary of the Stopping Distances

Distance in Feet (Corrected Dist.)	GVWR		LLVW		Maximum Allowable
	Minimum	Maximum	Minimum	Maximum	(ft.)
1.2 Service Brakes	290.5	313.5	222.3	245.3	GVWR – 355 LLVW – 335
Failed Primary Reservoir	N/A	N/A	325.7	400.4	GVWR – N/A LLVW – 720
Failed Secondary Reservoir	N/A	N/A	310.7	364.8	GVWR – N/A LLVW – 720
Failed Primary Control Line	N/A	N/A	258.9	282.7	GVWR – N/A LLVW – 720

The vehicle passed the Stability and Control and Grade Holding tests.

Section 4.0

Test Data

**TEST DATA
TABLE 3
VEHICLE INFORMATION SHEET-FMVSS 121**

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Test No.: 20040769/1214

Test Date(s): 10/04/05 – 10/19/05

Test Facility/Location: TRC /Transportation Research Center Inc.; East Liberty, Ohio

Truck/Tractor Year, Make, and Model: 2006 Mack Vision CXN613 Truck Tractor

VIN: 1M1AK06Y16N011449

GVWR: 52,000 lbs. GAWRs: 12,000 lbs. – Front; 20,000 lbs. – Int. 20,000 lbs. Rear

CENTER OF GRAVITY HEIGHT (in): Not measured

Initial Odometer: 684 mi.

Wheelbase: Truck, (in): 191

Trailer, (in): 336

Retarder(s) Type(s): None

Aerodynamic Treatments: Yes X No

BRAKES:

	Type ¹	Size	Make	Lining (Edge
Code)				
Axles:				
Front	<u>Cam</u>	<u>15 x 4 in.</u>	<u>Meritor</u>	<u>R301FF</u>
Int.	<u>Cam</u>	<u>16.5 x 7 in.</u>	<u>Meritor</u>	<u>R301FF</u>
Rear	<u>Cam</u>	<u>16.5 x 7 in.</u>	<u>Meritor</u>	<u>R301FF</u>

¹ Cam, disc, wedge, etc.

BRAKE DRUM/ROTOR:

	Type ²	Make	Dust Shields Installed?
Axles:			
Front	<u>Cast Drum</u>	<u>Gunite</u>	<u>No</u>
Int.	<u>Cast Drum</u>	<u>Gunite</u>	<u>Yes</u>
Int.	<u>Cast Drum</u>	<u>Gunite</u>	<u>Yes</u>

² Cast or composite drum, vented or non-vented rotor, etc.

....Continued

ACTUATION DETAILS:

	AIR CHAMBERS		SLACK ADJUSTERS		
	Make Cam Rotation ⁴	Type ³	Length or Wedge angle	Mfr	
Axles:					
Front	<u>Haldex</u>	<u>24</u>	<u>N/A</u>	<u>Haldex</u>	<u>Same</u>
Int.	<u>Haldex</u>	<u>3030</u>	<u>N/A</u>	<u>Haldex</u>	<u>Same</u>
Rear	<u>Haldex</u>	<u>3030</u>	<u>N/A</u>	<u>Haldex</u>	<u>Same</u>

³ Size and diaphragm or piston

⁴ Same or opposite to forward wheel rotation

TIRES

	Pressure (psi)	Size	Make	Model	Static Loaded Radius	
					*Measured	Databook
Axles:						
Front						
Data	<u>105 psi</u>	<u>11R22.5</u>	<u>Goodyear</u>	<u>G149 RSA</u>	<u>20.3 in.</u>	<u>No</u>
Int.						
Data	<u>105 psi</u>	<u>11R22.5</u>	<u>Goodyear</u>	<u>G149 RSA</u>	<u>20.4 in.</u>	<u>No</u>
Rear						
Data	<u>105 psi</u>	<u>11R22.5</u>	<u>Goodyear</u>	<u>G149 RSA</u>	<u>20.4 in.</u>	<u>No</u>

*Measured at LLVW.

REMARKS: There were dual tires at each wheel end on the rear axle.

ABS (w/ traction control):

Mfr: Bendix (formerly Eaton) Model: Not Available Configuration: Not Available

FRONT SUSPENSION:

Type: Taper leaf spring Make: Not Available Model: Not Available

....Continued

REAR SUSPENSION:

Type: Air Bag Make: Mack Model: Not Available

Rear Axle Spread, (in): 97.5 in. Overall Width (SAE J693): N/A

FIFTH WHEEL:

Fifth Wheel Height Relative to Ground (in): 48

Fifth Wheel Position, (in) ⁵: 38

⁵ Relative to rear axle centerline

AIR SYSTEM:

Compressor Capacity (cfm): 18.7 per specifications

Cut-out (psi): 120 Cut-in (psi): 90

Crack Pressure Ratings (psi)⁵:

1st Axle: N/A 2nd Axle: N/A Treadle Valve⁶: N/A

⁶ Total crack pressures between treadle valve and brake chambers

Front Axle Limiting: No Data

Air Dryer: Meritor

Air Compounding: No Data

Number of Brakes Controlled: 4S/4M

AIR TANK VOLUMES. (cu. in.):

Supply: 1,074 Primary: 3,695 Secondary: 1,470

Auxiliary: No Data Isolated From Service? No

*Manufacturer supplied data.

....Continued_

SPECIAL CONDITIONS:

Special conditions or equipment that might affect brake performance: None.

WEIGHTS (lbs):

	Empty	LLVW	Burnish	GVWR	GAWR
Axle:					
Front	<u>9,470</u>	<u>9,870</u>	<u>9,690</u>	<u>11,980</u>	<u>12,000</u>
Int.	<u>3,690</u>	<u>3,740</u>	<u>23,640</u>	<u>19,930</u>	<u>20,000</u>
Rear	<u>3,720</u>	<u>3,790</u>	<u>18,720</u>	<u>19,050</u>	<u>20,000</u>
Total:	<u>16,880</u>	<u>17,400</u>	<u>52,050</u>	<u>50,960</u>	

**TEST DATA
TABLE 4
VERIFICATION OF REQUIRED EQUIPMENT**

Vehicle: 2006 Mack Vision C60700 Vehicle Number: 787
 Date: 10-20-2005 Driver: K. Easterday Technician: B. Bean

SERVICE BRAKES

YES

NO

All Wheels Equipped with Brakes

X

All Brakes Equipped with Automatic Brake Adjusters

X

Brake Adjustment Indicators are visible from a location adjacent to or beneath the vehicle

X

ANTILOCK BRAKE SYSTEM

Antilock System Installed

X

Proper axle control

X

Comments: None

Antilock Warning Signal within Drivers Field-of-View
Black letters, yellow background, no audible warning

X

SERVICE RESERVOIRS

No. of Reservoirs 3

Automatic Condensate drain valve(s) or supply reservoir

X

Automatic Operation of condensate drain valve

X

Each Reservoir has a Drain Valve which can be manually operated

X

....Continued

PARKING BRAKES

Parking Brake Control Separate from Service Brake Control X

Parking Brake Control Accessible from Operator's Seat X

Parking Brake control is identified in a manner that specifies its operation X

Parking Brake Control Operates Parking Brakes of Towed Vehicle X N/A Yes No

REMARKS: None

LABORATORY TESTS

TABLE 5

BRAKE ACTUATION AND RELEASE TIMES

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-06-2005

Driver: T. Davis

Observer/Video: B. Bean

BRAKE ACTUATION AND RELEASE TIMES

ABS "On"	Front Axle		Int. Axle		Rear Axle		50 in ³ Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
Run No. 1	.295	.316	.355	.403	.355	.442	N/A	N/A
2	.284	.332	.349	.411	.349	.450	N/A	N/A
3	.284	.339	.349	.426	.349	.466	N/A	N/A
Avg.	.288	.329	.351	.413	.351	.453	N/A	N/A

ABS "Off"	Front Axle		Int. Axle		Rear Axle		50 in ³ Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
Run No. 4	.284	.339	.347	.426	.347	.466	N/A	N/A
5	.308	.347	.367	.434	.367	.474	N/A	N/A
6	.355	.368	.418	.451	.418	.488	N/A	N/A
Avg.	.316	.351	.377	.437	.377	.476	N/A	N/A

ABS "Open"	Front Axle		Int. Axle		Rear Axle		50 in ³ Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
Run No. 7	.296	.341	.362	.424	.362	.470	N/A	N/A
8	.278	.358	.349	.442	.355	.474	N/A	N/A
9	.296	.332	.362	.418	.362	.450	N/A	N/A
Avg.	.290	.344	.358	.428	.360	.465	N/A	N/A

ABS "Short"	Front Axle		Int. Axle		Rear Axle		50 in ³ Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
Run No. 10	.289	.347	.355	.434	.355	.466	N/A	N/A
11	.290	.355	.361	.434	.367	.478	N/A	N/A
12	.284	.339	.355	.426	.355	.458	N/A	N/A
Avg.	.288	.347	.357	.431	.359	.467	N/A	N/A

Continued on next page.

LABORATORY TESTS
TABLE 5 -continued
BRAKE ACTUATION AND RELEASE TIMES

Comments:

All apply and release timing results were within the specified requirement.

The 50 in³ reservoir did not reach 60 psi during the test and therefore no timing results are available.

ROAD TESTS

TABLE 6
PARK BRAKE CHAMBER ACTUATION PRESSURE

PARKING BRAKE TESTVehicle: 2006 Mack Vision C60700Vehicle Number: 787Date: 10-6-2005Driver: K. Easterday**AXLE #: INT.**

RUN NUMBER	PRESSURE IN PARKING CHAMBER AFTER 3 SECONDS (PSI)	
	LEFT	RIGHT
1	0	0
2	0	0
3	0	0
AVERAGE	0	0

AXLE #: REAR

RUN NUMBER	PRESSURE IN PARKING CHAMBER AFTER 3 SECONDS (PSI)	
	LEFT	RIGHT
1	0	0
2	0	0
3	0	0
AVERAGE	0	0

If average pressure is less than or equal to 3 psi, use 0 psi

REMARKS: Average time for all locations to reach 0 psi was 1.5 seconds.

**ROAD TESTS
TABLE 7
BURNISH**

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

8.1 BURNISH TEST WEIGHT			
STEER AXLE: 9,690 lbs. INT. AXLE: 23,640 lbs. REAR AXLE: 18,720 lbs.			
Driver No.	Date	Odometer Start	Odometer End
1	10/04/05	701	956
2	10/05/05	957	1131
3	10/05/05	1131	1206
N/A			

	Date	Time	Odometer
Test Start	10/04/05	16:09	701
Test Finish	10/05/05	22:40	1206

	ADJUSTMENT LEVELS					
	1L	1R	2L	2R	3L	3R
Initial	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.
1st	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.
2nd	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.
3rd	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.
Final	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.	No Adjust.

REMARKS: Upon arrival the vehicle's brakes were checked and found to be within the customer's recommended specifications of 5/8 in. "free-stroke" method. The adjustment checks occurred at the standard prescribed intervals; however, no adjustments were needed throughout the entirety of the test.

....Continued

Snub #	Initial Speed (mph)	Average Cntrl. Press. (psi)	Avg. Decel (ft/s ²)	Initial Brake Temperatures °F					
				1L	1R	2L	2R	3L	3R
1	38	46.9	8.0	115	113	147	147	154	152
25	40	69.1	11.0	291	306	393	376	439	468
50	40	52.3	9.8	262	278	442	438	512	560
75	40	51.4	10.5	254	273	441	452	522	579
100	40	40.3	8.6	254	269	446	461	529	584
125	40	50.6	10.4	253	264	449	466	538	577
150	40	49.6	10.4	242	253	383	393	443	468
175	40	48.1	10.2	256	267	448	460	530	552
200	40	49.8	10.5	251	263	467	486	555	567
225	40	52.2	10.9	256	274	476	500	566	570
250	41	47.4	10.3	248	266	478	502	558	560
275	40	44	9.8	252	265	342	361	378	401
300	40	44	10.2	249	269	435	468	507	529
325	41	39	9.6	254	268	461	495	540	552
350	41	37.9	9.6	262	275	424	460	500	528
375	41	41.7	9.6	263	278	469	508	552	560
400	40	38.6	10.0	263	272	406	435	465	481
425	41	41.8	9.5	277	291	478	519	551	563
450	40	43.2	10.2	228	226	351	376	396	406
475	40	47.4	10.8	239	268	435	466	509	525
500	40	47.4	10.3	223	246	466	490	533	536

(Table continued on next page)

REMARKS: "1" – steer axle; "2" – intermediate drive axle; "3" – rear drive axle.

....Continued

Snub #	Initial Speed mph	Ambient Temp °F	Comments	Driver Initials	Time
1	38	80		RH	
25	40	80		RH	
50	40	81		RH	
75	40	80		RH	
100	40	78		RH	
125	40	76	Brake Adjustment Check	RH	
150	40	72		RH	
175	40	69		RH	
200	40	68		RH	
225	40	66		RH	
250	41	65	Brake Adjustment Check	RH	
275	40	59		KE	
300	40	61		KE	
325	41	64		KE	
350	41	69		KE	
375	41	73	Brake Adjustment Check	KE	
400	40	80		KE	
425	41	80		KE	
450	40	67		RH	
475	40	66		RH	
500	40	66	Brake Adjustment Check	RH	

REMARKS: None

**STABILITY & CONTROL
ROAD TESTS
TABLE 8
STABILITY & CONTROL - GVWR**

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-12-2005

Driver: K. Easterday

Observer/Video: S. Garee

Manually Controlled Retarder: N/A

Maximum Drive Through Speed 31.0 mph

75% of Max Drive Through Speed 23.0 mph

STABILITY & CONTROL - GVWR

Stop No.	Initial Speed (mph)	Apply Time (sec)	Approx. Dist. Out of Lane (ft)	Number Markers Hit	Comments
1	23.4	N/A	0	0	Video Tape
2	23.2	N/A	0	0	Video Tape
3	23.2	N/A	0	0	Video Camera Issue
4	23.4	N/A	0	0	Video Tape
5	23.5	N/A	0	0	Video Tape

Ambient Temp.: 63°F

Wind Speed: 2.4 mph

Direction: 152° S

REMARKS: The video camera battery died during stop number 3; therefore, an additional run was performed.

ROAD TESTS
TABLE 9
STABILITY & CONTROL - LLVW

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-13-2005

Driver: K. Easterday

Observer/Video: B. Bean

Manually Controlled Retarder: N/A

Maximum Drive Through Speed 33.0 mph

75% of Max Drive Through Speed 25.0 mph

STABILITY & CONTROL-LLVW

Stop No.	Initial Speed (mph)	Apply Time (sec)	Approx. Dist. Out of Lane (ft)	Number Markers Hit	Comments
1	24.5	N/A	0	0	Video Tape
2	24.6	N/A	0	0	Video Tape
3	25.4	N/A	0	0	Video Tape
4	23.6	N/A	0	0	Video Tape

Ambient Temp.: 57°F

Wind Speed: 1 mph

Direction: 302° W

REMARKS: Relative to "Apply Time," treadle output pressure never reached 85 psi.

ROAD TESTS
TABLE 10
SERVICE BRAKE STOPPING TEST - GVWR

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-13-2005

Driver: K. Easterday

Observer/Video: B. Bean

Manually Controlled Retarder: N/A

60 MPH SERVICE BRAKE STOPS AT GVWR

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance Per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1	107.9	60.5	319.2	313.5	Y	N	Video Tape
2	99.1	59.5	291.5	296.1	Y	N	Video Tape
3	102.0	60.0	303.4	303.6	Y	N	Video Tape
4	100.6	59.8	298.5	300.0	Y	N	Video Tape
5	108.1	59.7	290.0	293.0	Y	N	Video Tape
6	106.6	59.8	288.8	290.5	Y	N	Video Tape

Ambient Temp.: 67°F

Wind Speed: 1 mph

Direction: 141°

REMARKS: Actual and corrected stopping distances for all runs did not exceed the maximum stopping distance requirement of **355 ft.**

**ROAD TESTS
TABLE 14
PARK BRAKE TEST
20% GRADE HOLDING - GVWR**

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-13-2005

Driver: K. Easterday

Parking Brake Chamber Pressure 0 psi Observer/Video: B. Bean, T. Davis

20% GRADE HOLDING - GVWR

<u> X </u> GVWR <u> </u> LLVW	Initial Brake Temperature (°F)	Control Pressure to Hold Vehicle (psi)	Movement to Become Stationary on Grade (inches)	Stationary on Grade For 5 minutes	
				Yes	No
	All Avg.				
Up Grade	168	49.3	0	X	
Down Grade	173	46.2	0	X	

Ambient Temp.: 67°F

Wind Speed: 3 mph

Direction: 67° NE

REMARKS: The test vehicle remained stationary on the grade facing upgrade and downgrade for the required 5-minute period.

ROAD TESTS
TABLE 15
SERVICE BRAKE STOPPING TEST - LLVW

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-17-05

Driver: K. Easterday

Observer/Video: B. Bean, T. Davis

Manually Controlled Retarder: N/A

60 MPH SERVICE BRAKE STOPS AT LLVW

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1	124.8	59.3	239.4	245.3	Y	NOX	Video Tape
2	111.3	59.5	234.1	237.9	Y	NOX	Video Tape
3	113.8	59.2	221.5	227.3	Y	NOX	Video Tape
4	113.9	60.2	227.3	226.1	Y	NOX	Video Tape
5	113.8	59.3	219.9	225.4	Y	NOX	Video Tape
6	112.2	59.4	217.6	222.3	Y	NOX	Video Tape

Ambient Temp.: 51°F

Wind Speed: 4 mph

Direction: 150° SE

REMARKS: Actual and corrected stopping distances for each run do not exceed the maximum stopping distance of **335 ft.**

ROAD TESTS
TABLE 16
EMERGENCY BRAKE STOPPING TEST,
PRIMARY RESERVOIR FAILED - LLVW

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-17-05 Driver: K. Easterday Observer/Video: B. Bean, T. Davis

Manually Controlled Retarder: N/A

PRIMARY RESERVOIR FAILURE AT LLVW
60 MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1	57.3	58.0	373.6	400.4	Y	NOX	Video Tape
2	58.3	58.3	310.8	329.5	Y	NOX	Video Tape
3	60.1	58.4	355.4	374.8	Y	NOX	Video Tape
4	57.4	59.2	317.1	325.7	Y	NOX	Video Tape
5	57.1	65.5	463.7	389.5	Y	NOX	Video Tape
6	54.4	58.4	372.3	392.9	Y	NOX	Video Tape

Ambient Temp.: 60°F

Wind Speed: 7 mph

Direction: 207° S

REMARKS: The brake was applied within 5 seconds after activation of the low-pressure warning. Actual and corrected stopping distances for each run do not exceed the maximum stopping distance of **720 ft.**

ROAD TESTS
TABLE 17
EMERGENCY BRAKE STOPPING TEST,
SECONDARY RESERVOIR FAILURE - LLVW

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-17-05

Driver: K. Easterday

Observer/Video: B. Bean, T. Davis

Manually Controlled Retarder: N/A

SECONDARY RESERVOIR FAILURE AT LLVW
60 MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
7	81.5	59.9	309.3	310.7	Y	NOX	Video Tape
8	78.9	58.8	318.9	331.8	Y	NOX	Video Tape
9	77.9	59.6	359.4	364.8	Y	NOX	Video Tape
10	74.5	59.4	335.3	342.1	Y	NOX	Video Tape
11	79.1	60.4	353.4	349.1	Y	NOX	Video Tape
12	78.8	60.4	358.7	353.7	Y	NOX	Video Tape

Ambient Temp. 62°F

Wind Speed: 5 mph

Direction: 191° S

REMARKS: The brake was applied within 5 seconds after activation of the low-pressure warning. Actual and corrected stopping distances for each run do not exceed the maximum stopping distance of **720 ft.**

ROAD TESTS
TABLE 18
EMERGENCY BRAKE STOPPING TEST
PRIMARY CONTROL LINE FAILURE AT LLVW
60 MPH EMERGENCY BRAKE STOPS

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-17-05 Driver: K. Easterday Observer/Video: B. Bean, T. Davis

Manually Controlled Retarder: N/A

PRIMARY CONTROL LINE FAILURE AT LLVW
60 MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
7	79.7	59.7	256.5	258.9	Y	NOX	Video Tape
8	52.8	59.4	269.0	274.6	Y	NOX	Video Tape
9	50.2	59.4	277.3	282.7	Y	NOX	Video Tape
10	57.7	59.2	269.8	276.8	Y	NOX	Video Tape
11	70.7	58.9	254.1	264.1	Y	NOX	Video Tape
12	50.3	59.2	267.7	274.7	Y	NOX	Video Tape

Ambient Temp.: 65°F

Wind Speed: 8 mph

Direction: 196° S

REMARKS: Actual and corrected stopping distances for each run do not exceed the maximum stopping distance of **720 ft.**

**ROAD TESTS
TABLE 19
PARK BRAKE TEST
20% GRADE HOLDING - LLVW**

Vehicle: 2006 Mack Vision C60700

Vehicle Number: 787

Date: 10-17-05 Driver: K. Easterday Observer/Video: B. Bean, T. Davis

Parking Brake Chamber Pressure N/A psi

20% GRADE HOLDING-LLVW

<u> </u> GVWR <u>X</u> LLVW	Initial Brake Temperature (°F)	Control Pressure to Hold Vehicle (psi)	Movement to Become Stationary on Grade (inches)	Stationary on Grade For 5 minutes	
				Yes	No
	All Avg.				
Up Grade	187	24.2	0	X	
Down Grade	156	30.9	0	X	

Ambient Temp.: 58°F

Wind Speed: 6 mph

Direction: 292° W

REMARKS: Vehicle held in both directions.

ROAD TESTS**TABLE 20
FINAL INSPECTION**Vehicle: 2006 Mack Vision C60700Vehicle Number: 787Date: 10-19-05Technician: B. Bean, T. Davis, K. Honchell**Brake Stroke Measurements at "Free-Stroke" (in.)**Axle 1 Left/Right 5/8 / 5/8Axle 2 Left/Right 5/8 / 5/8Axle 3 Left/Right 5/8 / 5/8**Service Brakes****YES****NO**

All Brakes Structurally Intact

X

All Brakes Function Properly

X

All Brakes Adjusted Within Manufacturer's Recommendation

XFinal Odometer: 1,384.7 mi.**REMARKS:**

Upon removal of the right intermediate axle drum a small quantity of axle lubricant was discovered leaking from the axle seal. Examination of the components showed no evidence of any sustained leak or contamination of brake components by the lubricant. There was no visible sign of a lubricant leak or contamination at any other brake position.

All brake components were undamaged. The front linings appeared to have approximately 75% total averaged drum contact. The intermediate linings appeared to have approximately 79% total averaged drum contact. The rear linings appeared to have approximately 80% total averaged drum contact. The linings presented either light or no surface glazing. All drums presented light material transfer, light polish, and light debris. The right rear drum presented a light "bluing" appearance. The left rear position presented a small tear out on both the leading and trailing linings representing an estimated total area of less than 5%. Overall, drums and linings presented normal appearance and color with no fractures or separations.

Section 5.0

Instrumentation List

Table
Instrumentation List

Instrumentation	Serial Number (I.D. No.)	Calibration Date	Next Calibration Date
A-DAT DSR-6 Radar Fifth Wheel	1400135	Daily on a measured mile	N/A
Lock-Up Detection System	TRC Prop.	Calibrated before test	N/A
Treadle Pressure Transducer	PT-827090	Calibrated before test using a dead weight	N/A
Pressure Transducer	PT-351132	Calibrated before test using a dead weight	N/A
Crossbow Accelerometer	CXL04LP1Z	Calibrated before test using a dead weight calibrator	N/A
Davis Weather System	WXA10910A1	10/15/04	10/15/05
Thermocouples	T52-0B-24K	Calibrated before test	N/A
Toledo Mettler Scales	5318823-5KD	08/31/05	11/30/05
Ashcroft Tire Pressure Gauge	MC1	06/03/05	06/05/06
Mansfield & Green, Dead Weight Tester	DW-6253	03/07/05	03/07/06
LINK System	2030	08/30/04	08/30/06
Dell PC (used with LINK)	43270	N/A	N/A
Pressure Gauge	AG-010	10/26/04	10/26/05

APPENDIX A

PHOTOGRAPHS



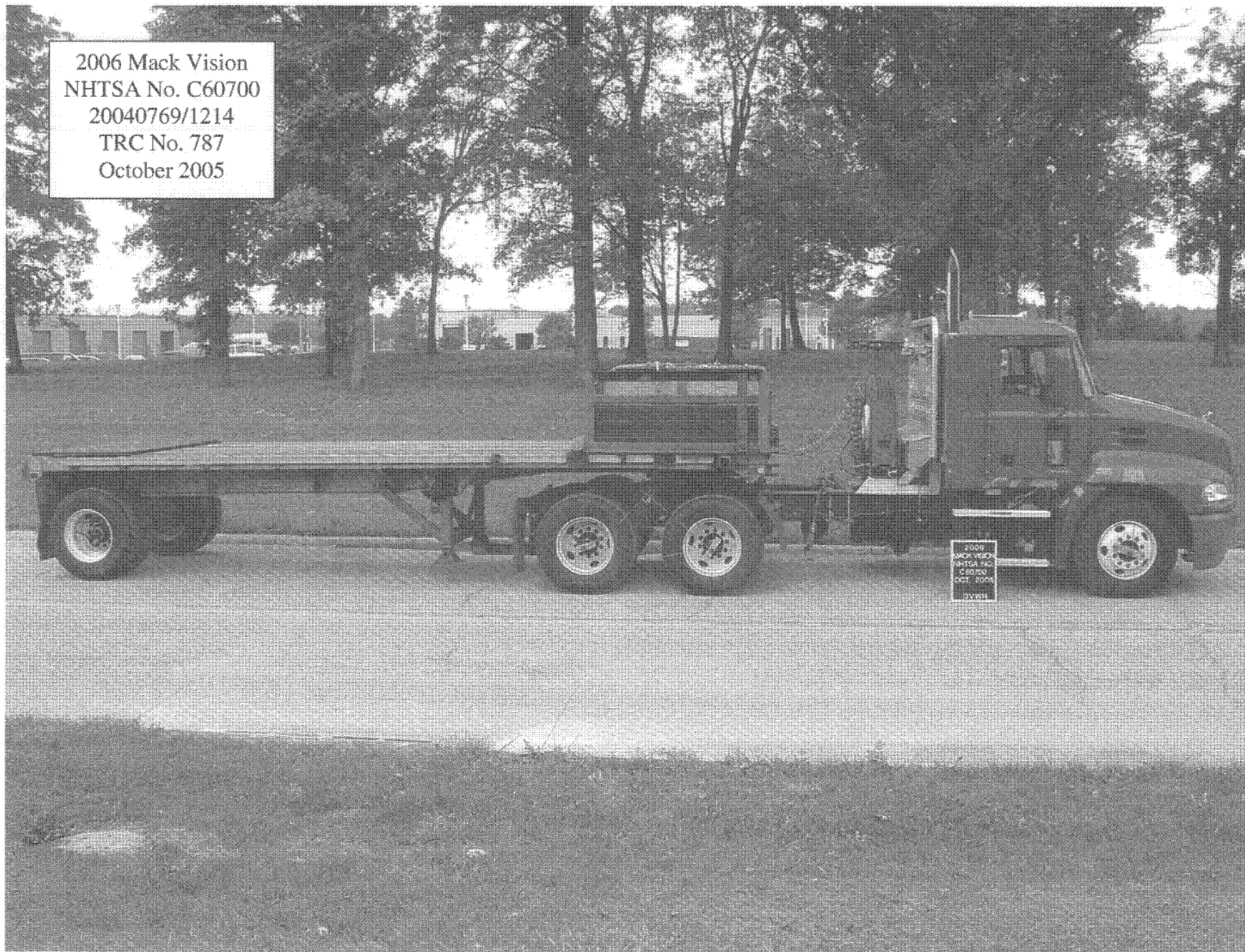
2006 Mack Vision
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TRC No. 787
October 2005

2006
MACK VISION
NHTSA NO.
C60700
OCT. 2005

GVWR

GVWR – Front View

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GVWR – Right Side View

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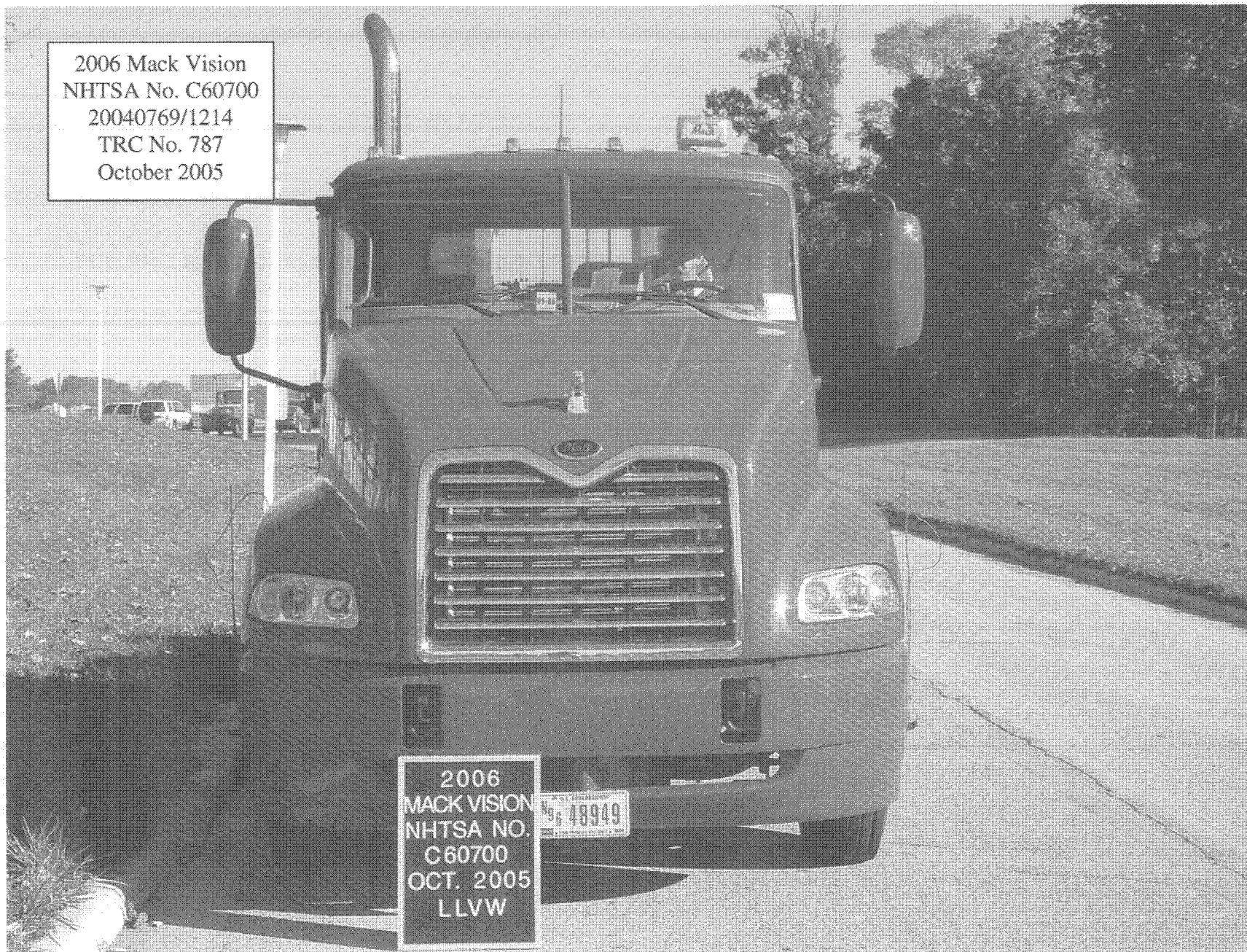


GVWR – Left Side View

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GVWR – Rear View



LLVW – Front View

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LLVW

LLVW – Right Side View

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2006
MACK VISION
NHTSA NO.
C60700
OCT. 2005
LLVW

LLVW – Left Side View

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October 2005

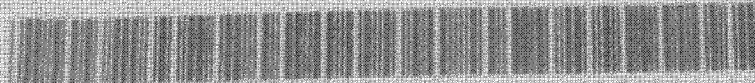


LLVW – Rear View

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MACK TRUCKS, INC.
Dublin, VA, U.S.A.
MODEL NO.: CXN613
SEQ. NO.: Z050708079
VIN: 1M1AK06Y16N011449 4MR21084



Manufacturer's Placard

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MANUFACTURED BY MACK TRUCKS, INC. IN 07/2005
 THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR SAFETY STANDARDS IN EFFECT ON THE DATE
 OF MANUFACTURE SHOWN ABOVE
 VEHICLE IDENTIFICATION NUMBER 1M1AK06Y1GN011449

GVWR 23587 KG / 52000 LB

	GVWR	TIRES	RIMS		
FRONT:	5443 KG (12000 LB)	WITH 11R22.5	, 22.5 X 8.25	, AT 724	KPA (105 PSI) COLD SINGLE
1ST INT.:	9072 KG (20000 LB)	WITH 11R22.5	, 22.5 X 8.25	, AT 724	KPA (105 PSI) COLD DUAL
2ND INT.:	0 KG (0LB)	WITH		, AT	KPA (PSI) COLD
REARMOST:	9072 KG (20000 LB)	WITH 11R22.5	, 22.5 X 8.25	, AT 724	KPA (105 PSI) COLD DUAL

VEHICLE TYPE: TRUCK TRACTOR

4MR3306

Manufacturer's Certification Label

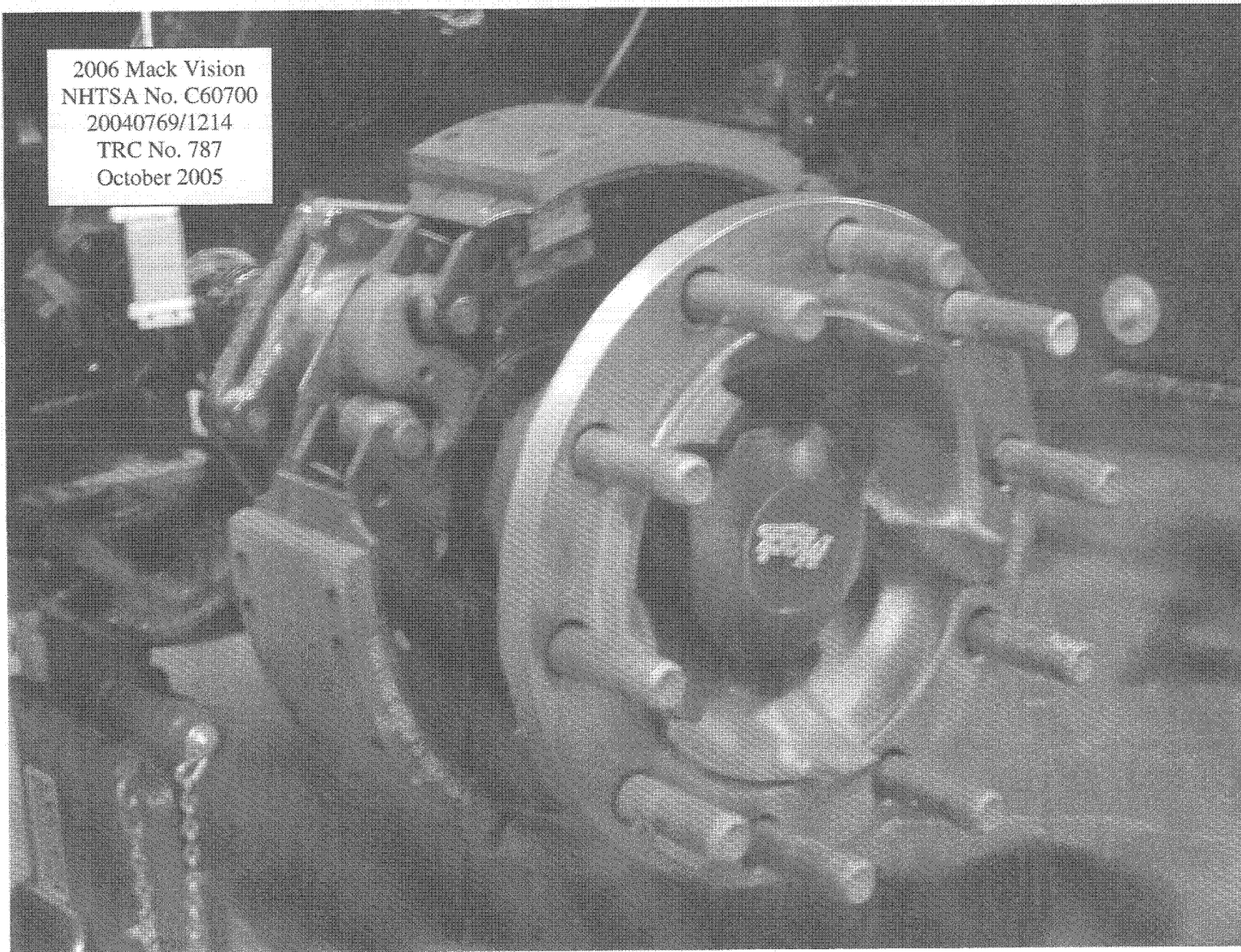
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VISION
by Mack

9' WARNING

Reservoirs – Top: Secondary/Wet; Bottom: Primary

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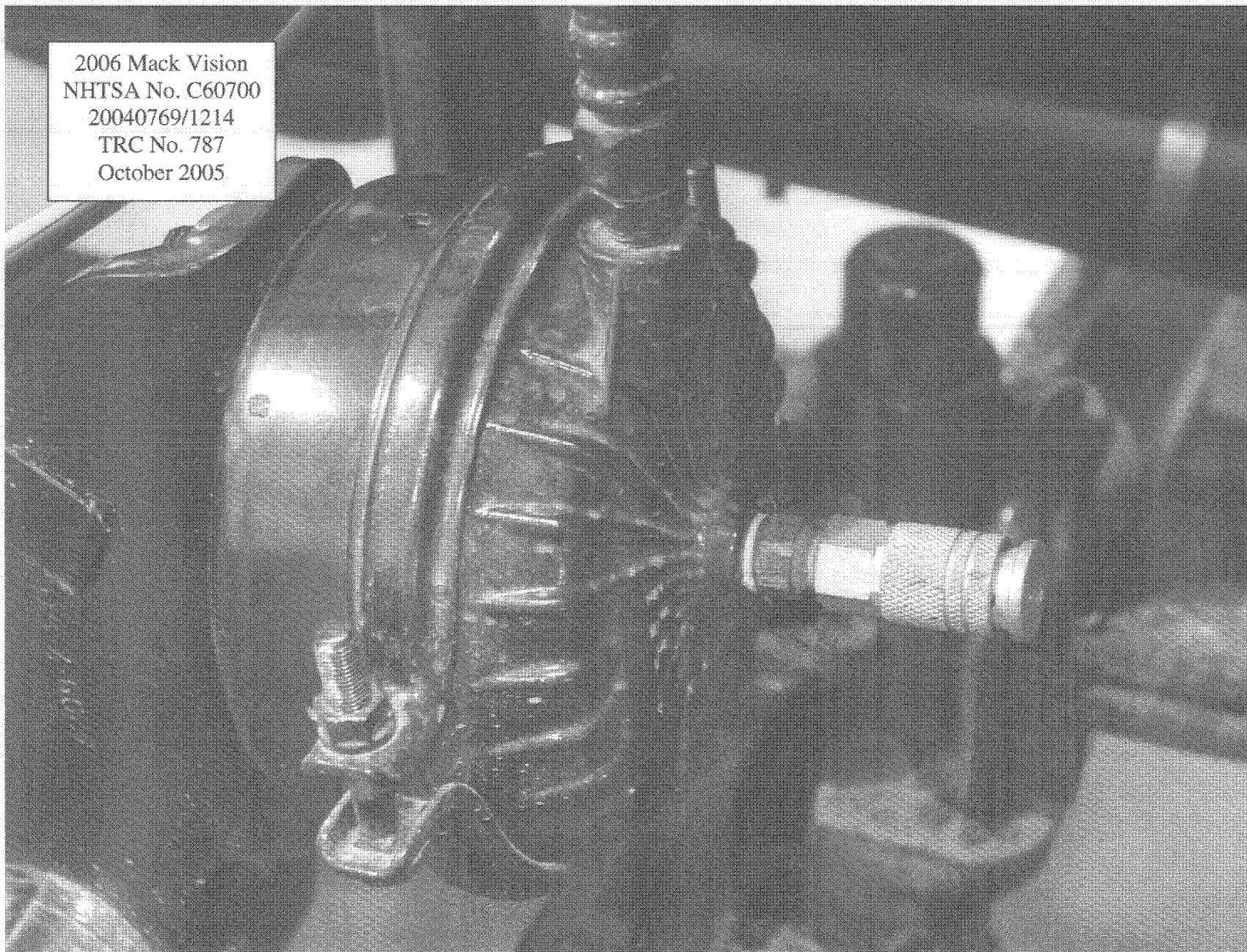


Left Steer Brake Assembly

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005

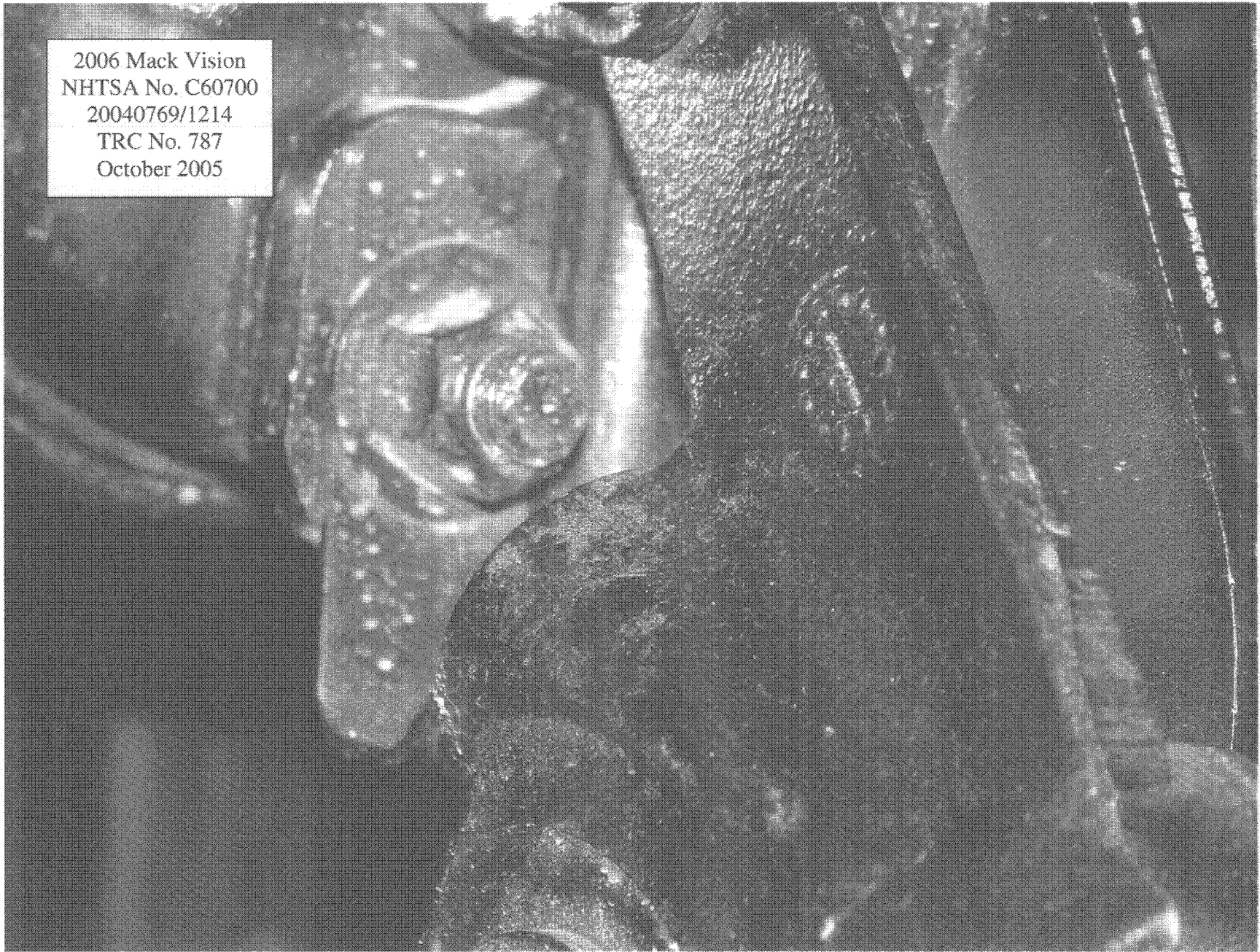
Left Steer Thermocouple Installation

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



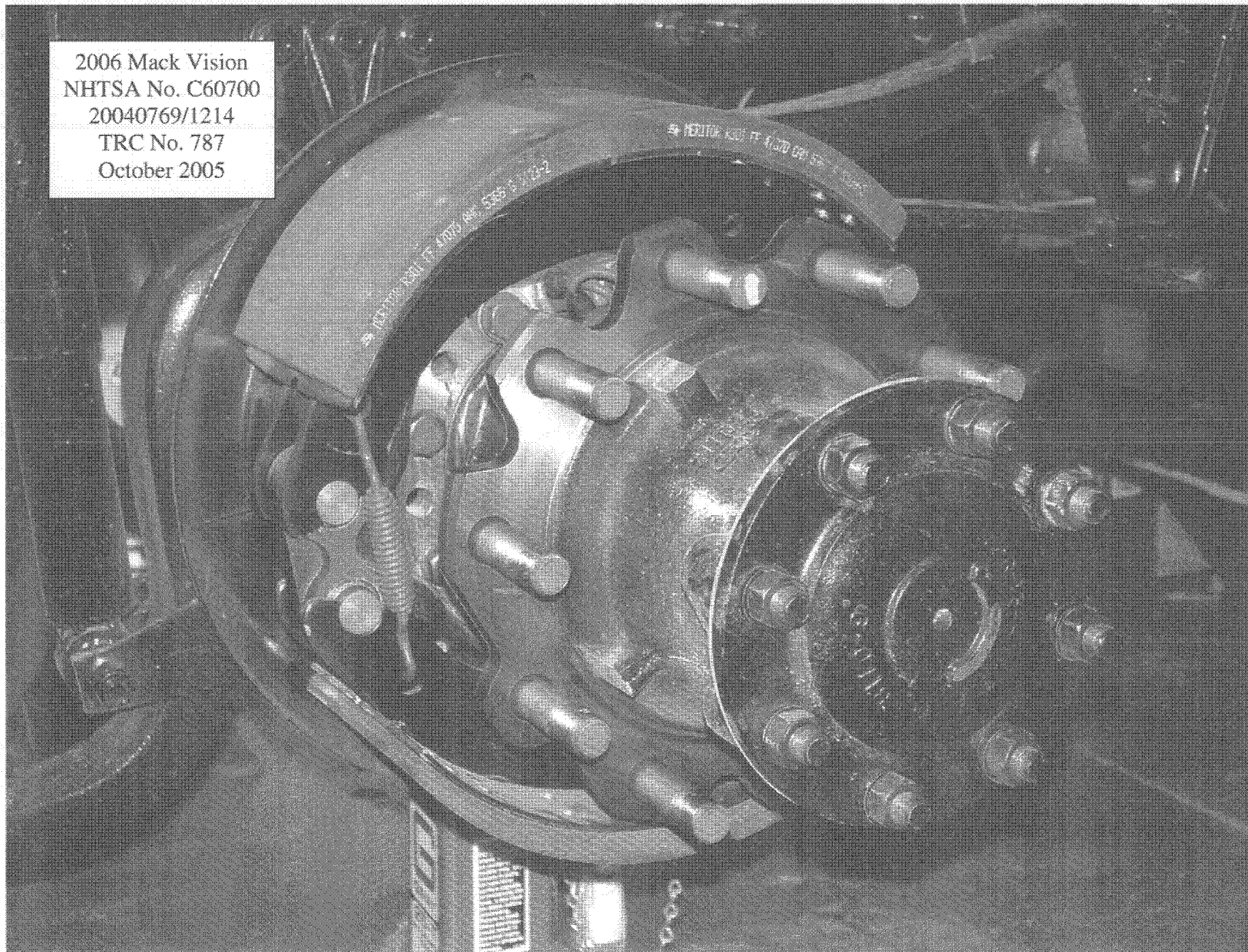
Left Steer Brake Chamber

2006 Mack Vision
NHTSA No. C60700
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October 2005



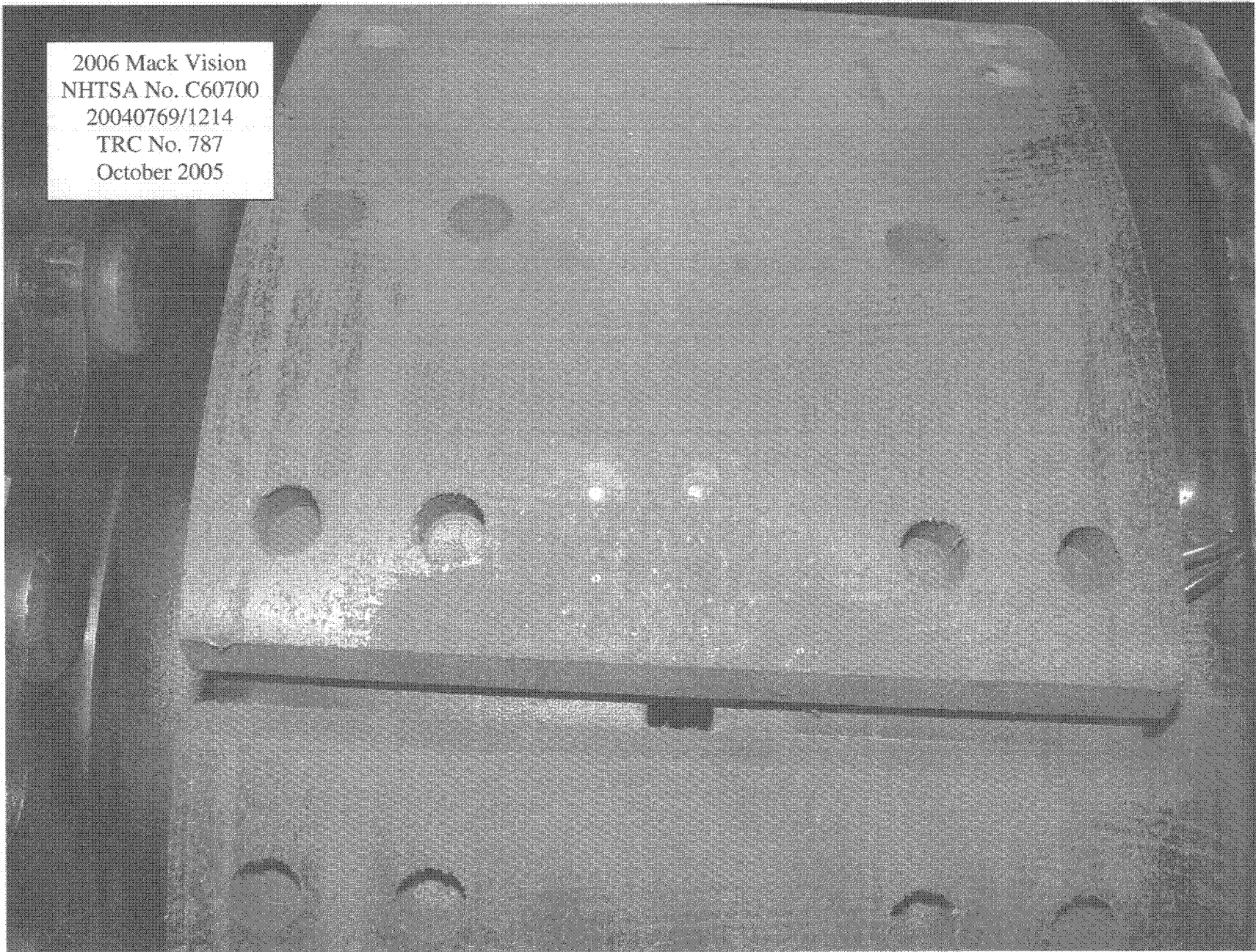
Left Steer Slack Adjuster

2006 Mack Vision
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October 2005



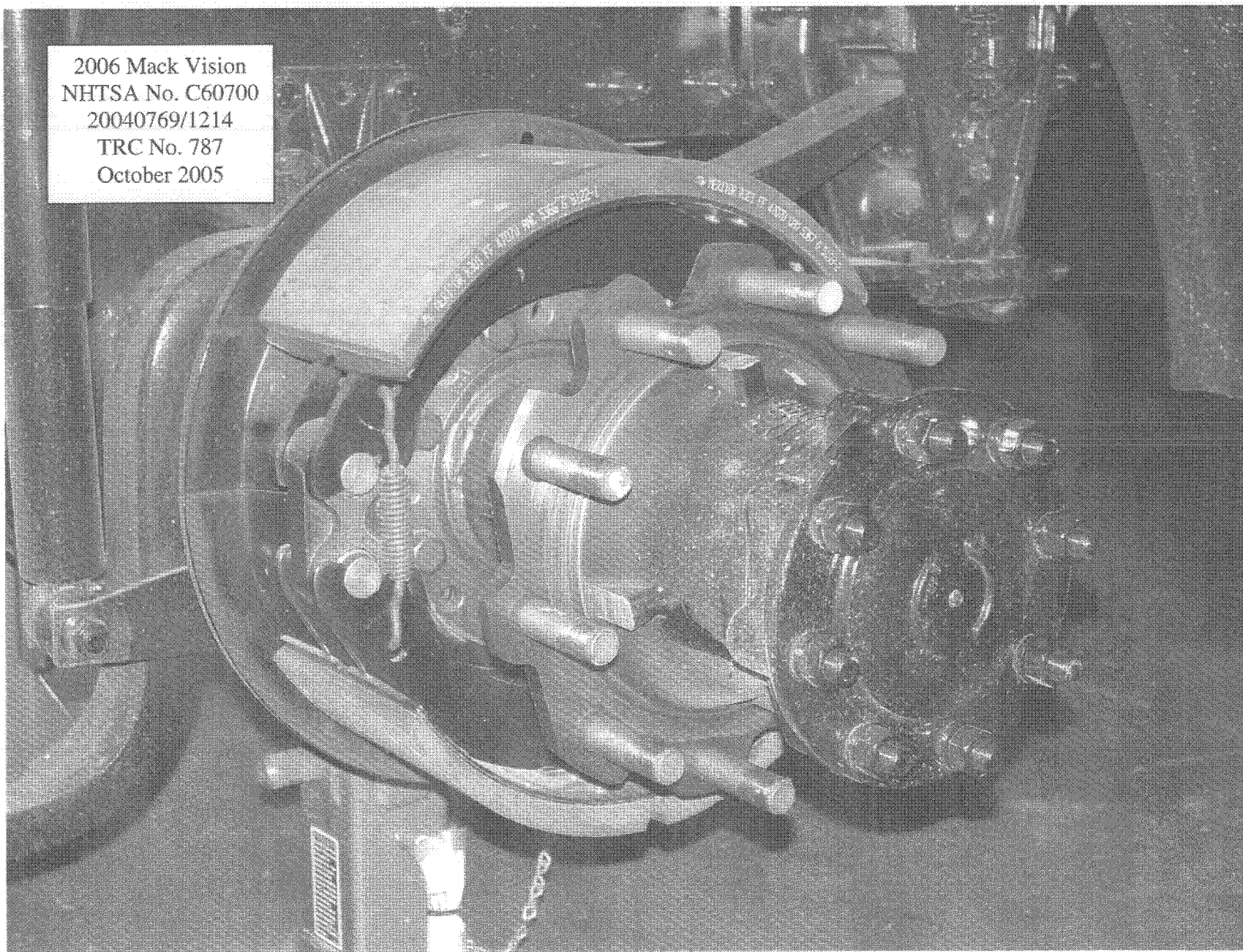
Right Rear Brake Assembly

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October 2005



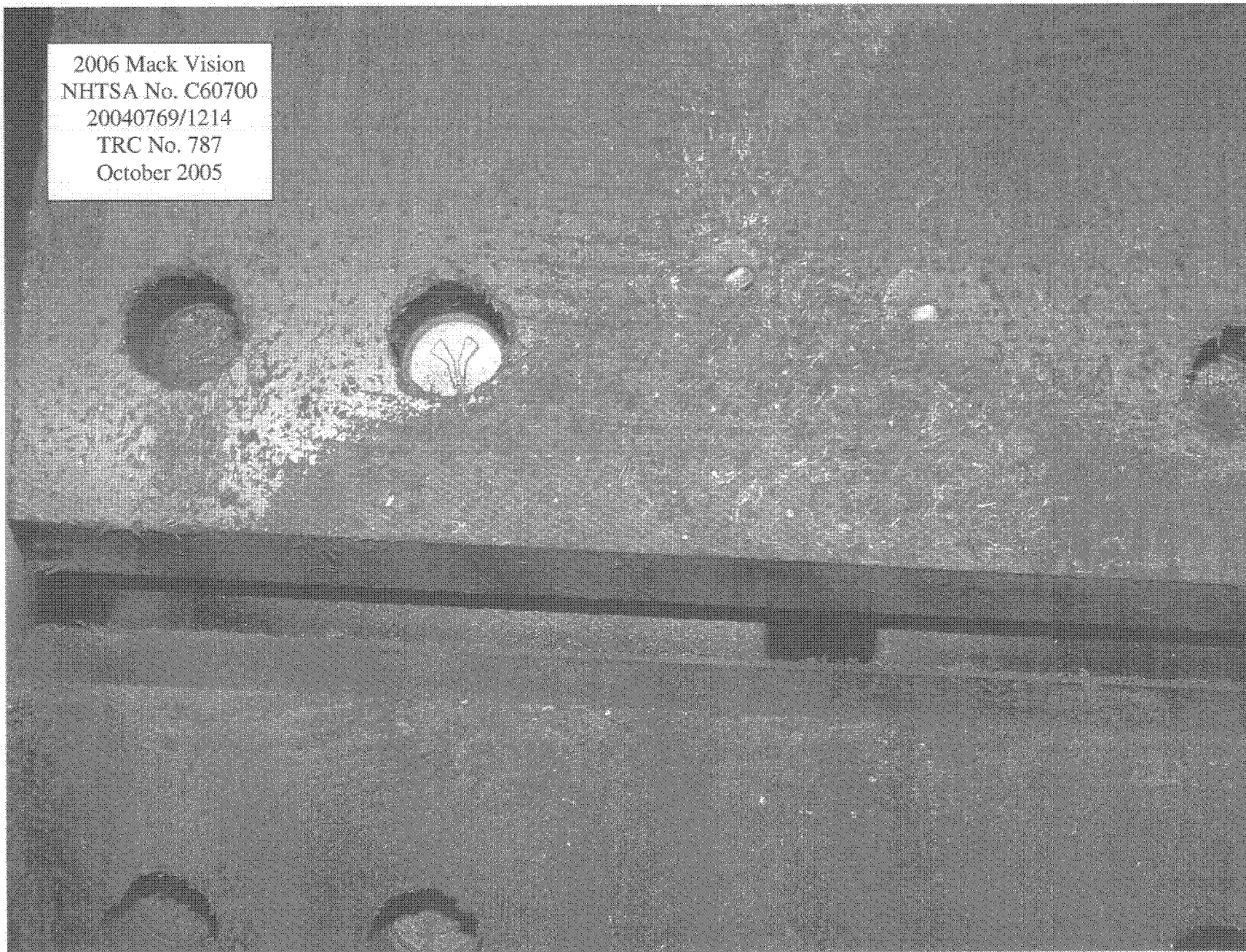
Right Rear Thermocouple Installation

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



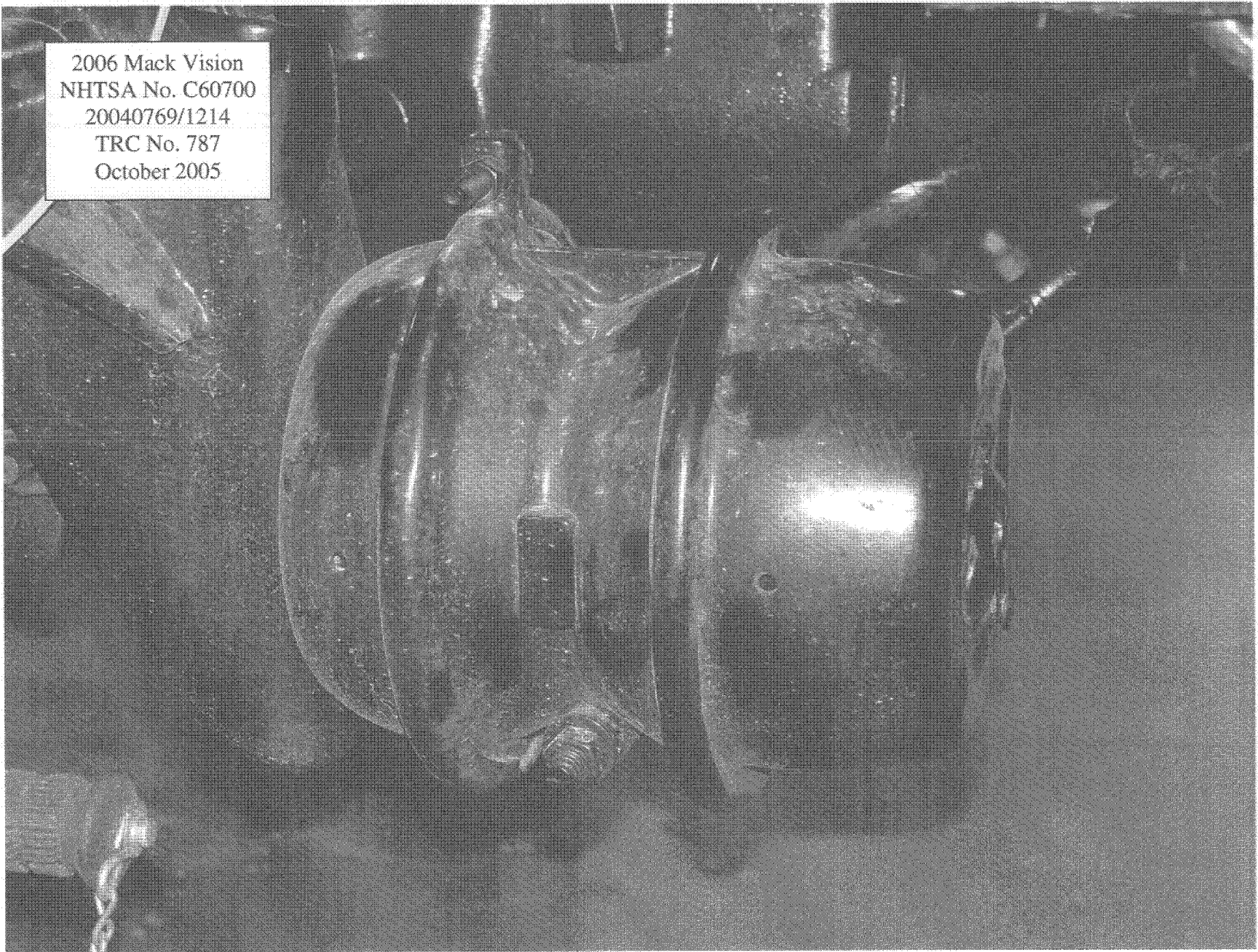
Right Intermediate Brake Assembly

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TRC No. 787
October 2005



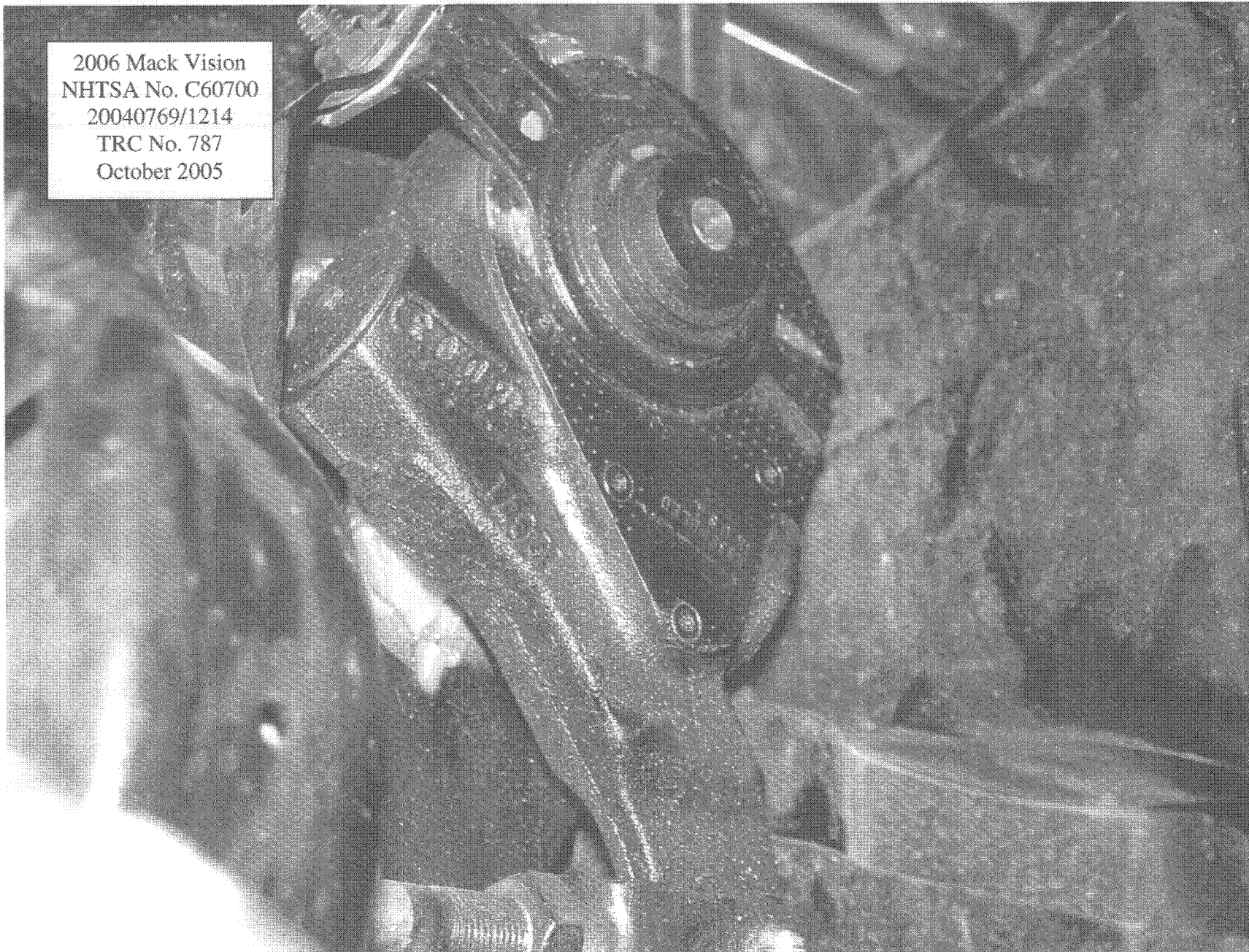
Right Intermediate Thermocouple Installation

2006 Mack Vision
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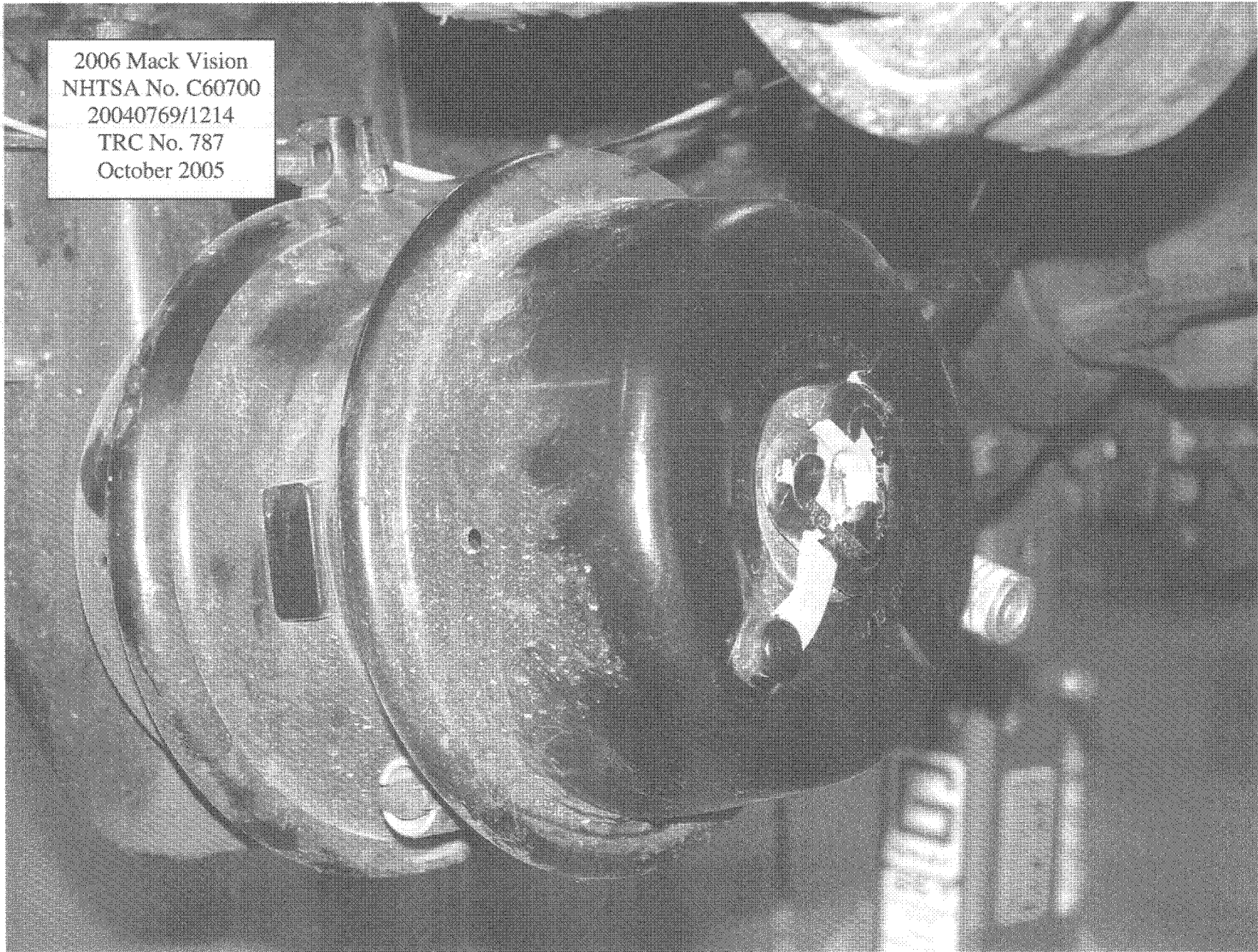
Right Intermediate Brake Chamber

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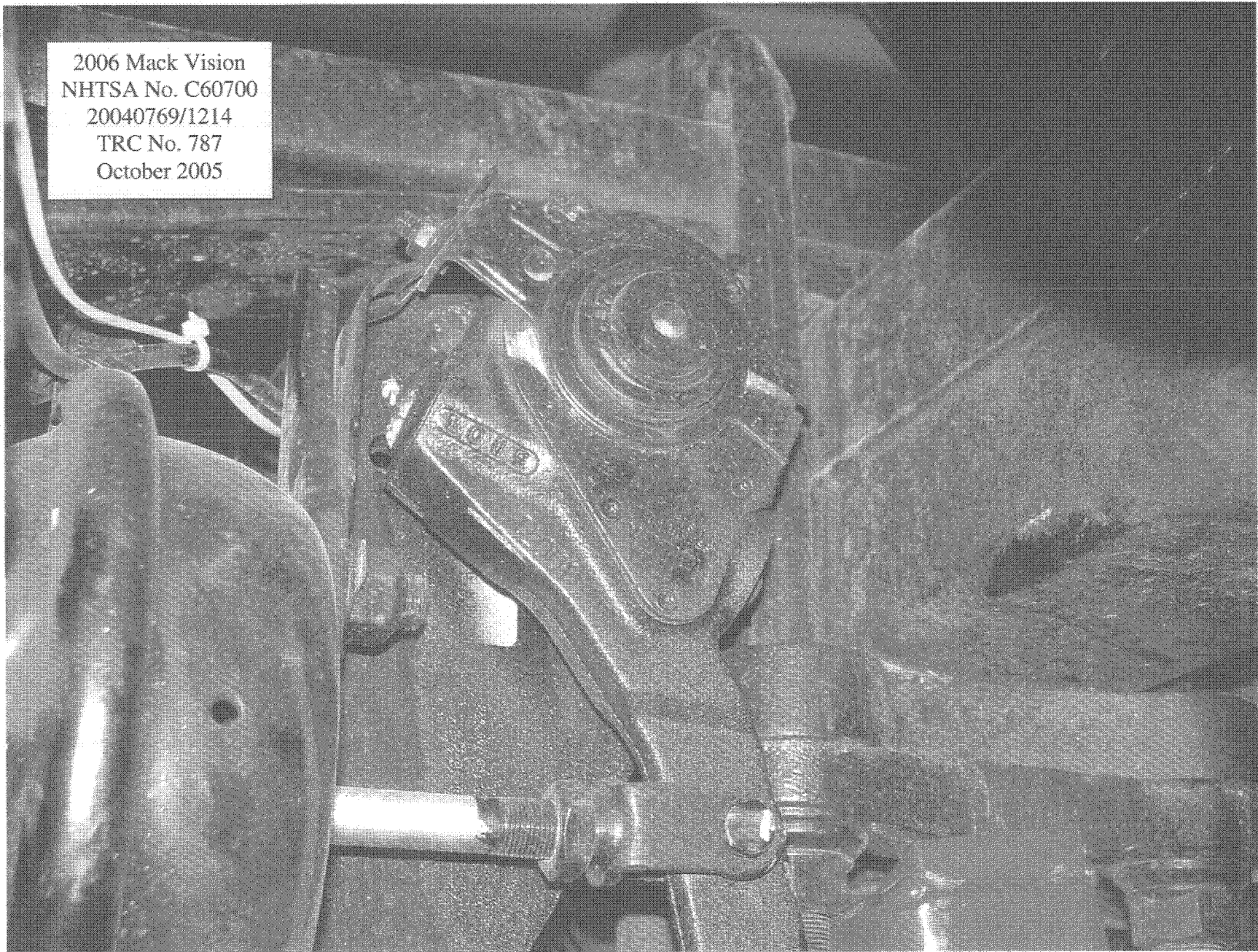
Right Intermediate Slack Adjuster

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20040769/1214
TRC No. 787
October 2005



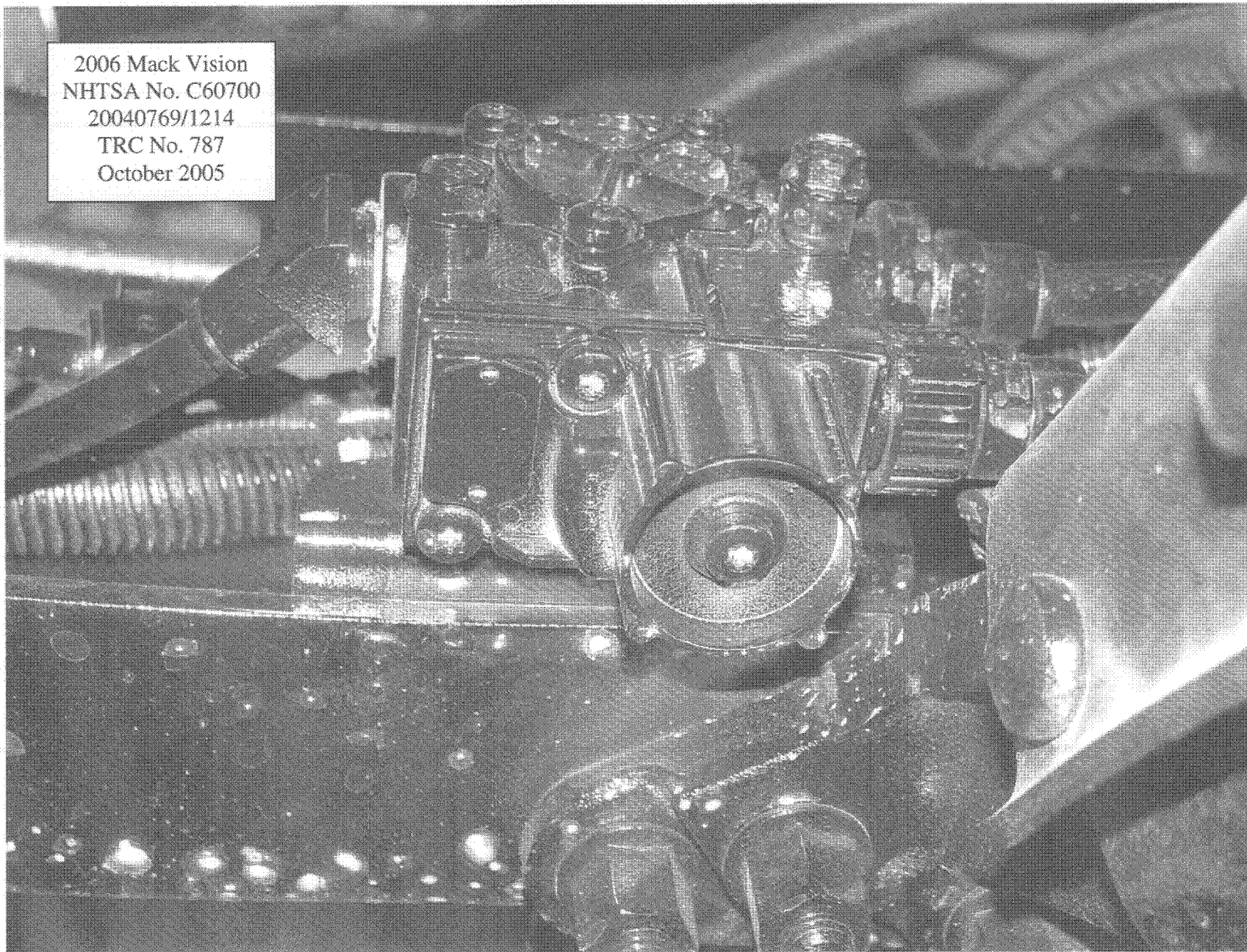
Right Rear Brake Chamber

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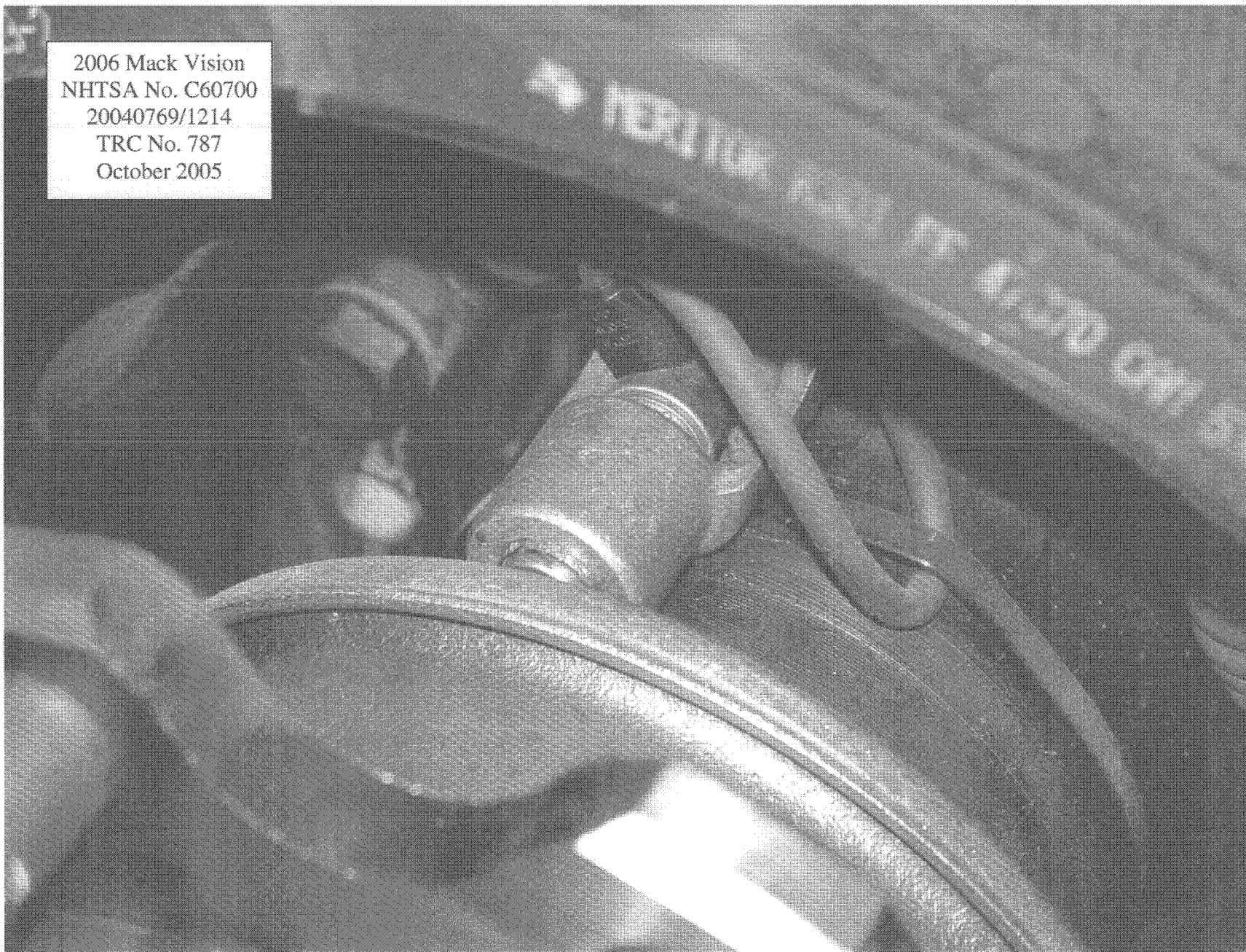
Right Rear Slack Adjuster

2006 Mack Vision
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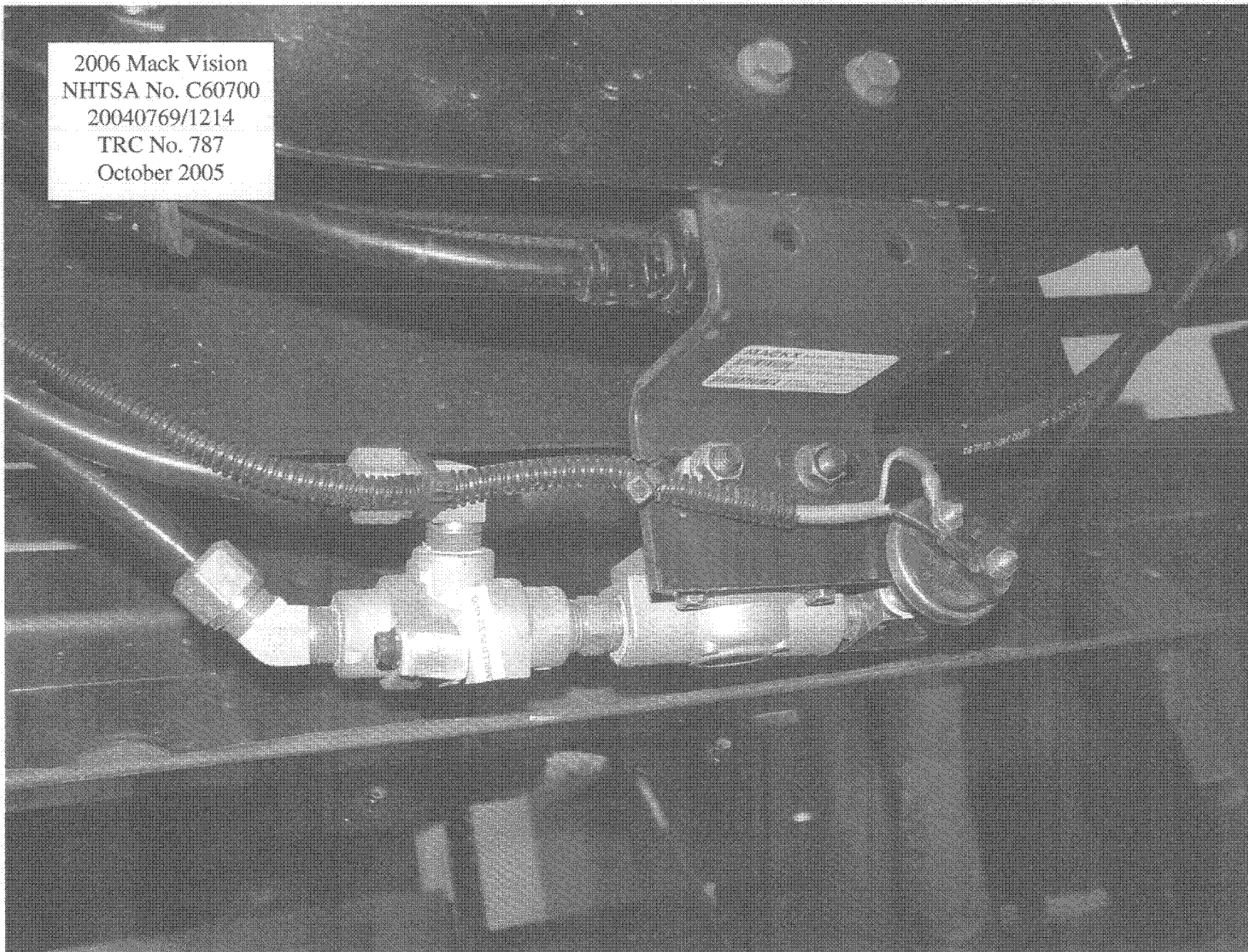
Front ABS Modulator

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Left Steer ABS Wheel Speed Sensor

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October 2005



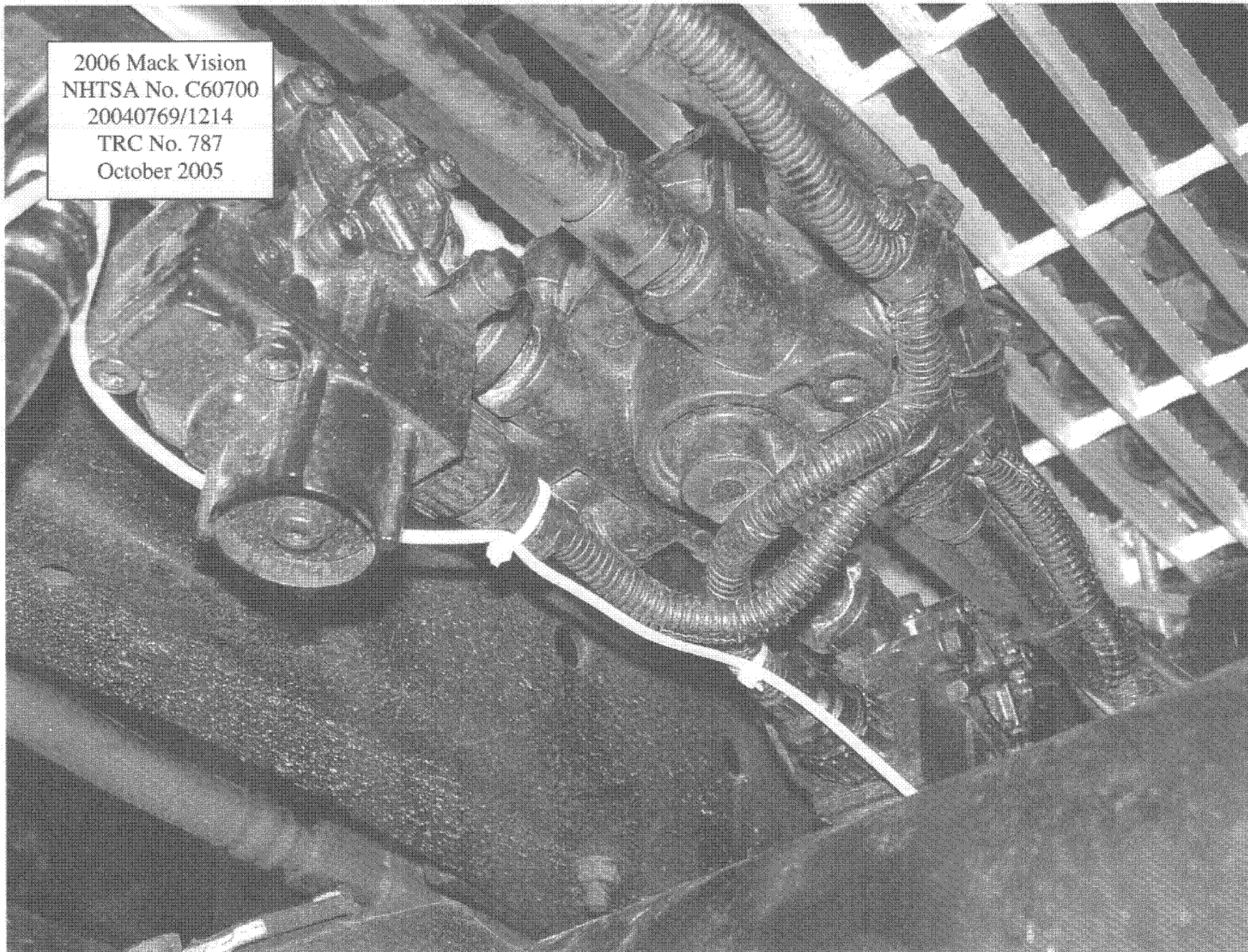
Front Quick Release Valve

2006 Mack Vision
NHTSA No. C60700
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TRC No. 787
October 2005



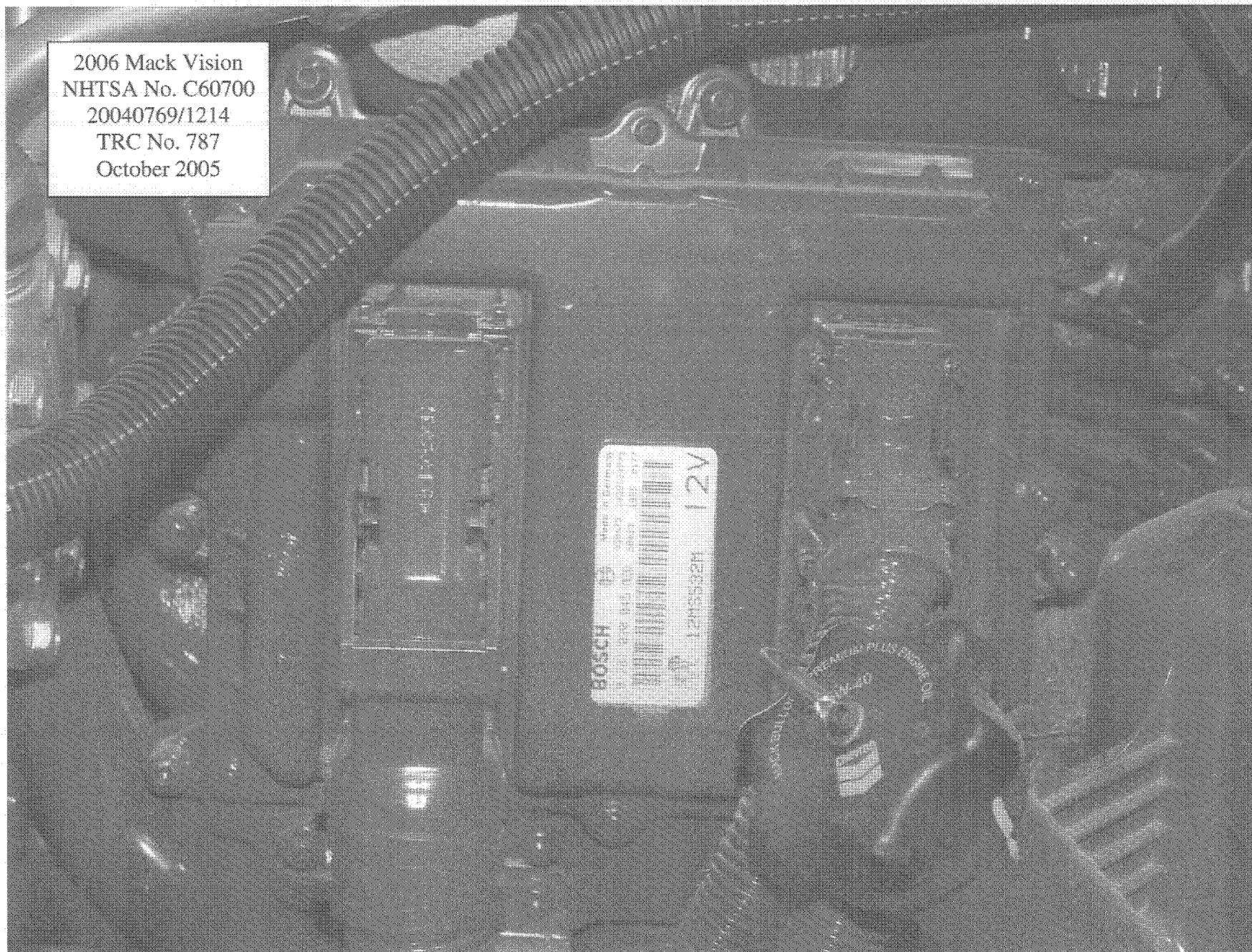
Right Rear ABS Wheel Speed Sensor

2006 Mack Vision
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20040769/1214
TRC No. 787
October 2005



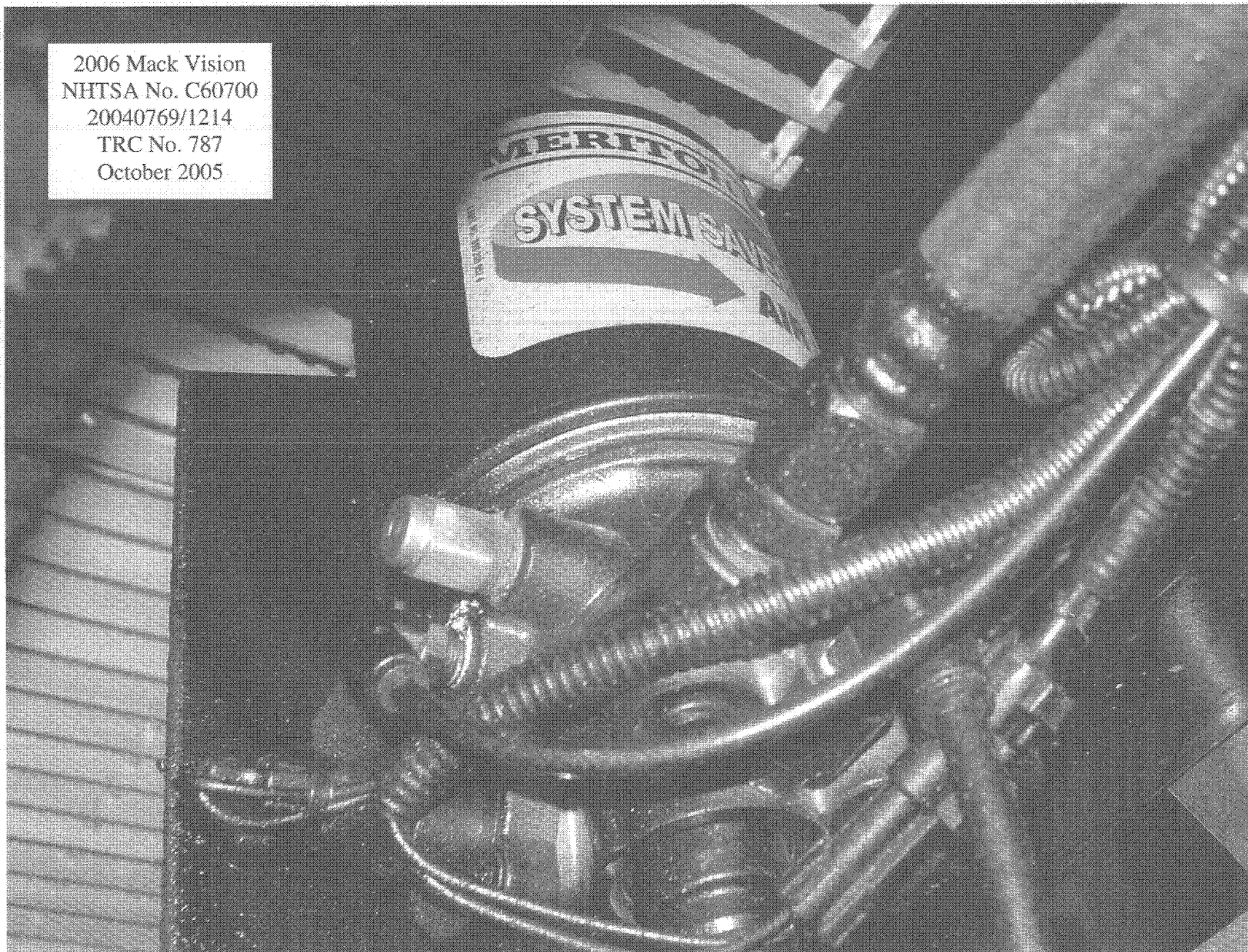
Rear Brake Relay Valve and Rear ABS Modulator Valve

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



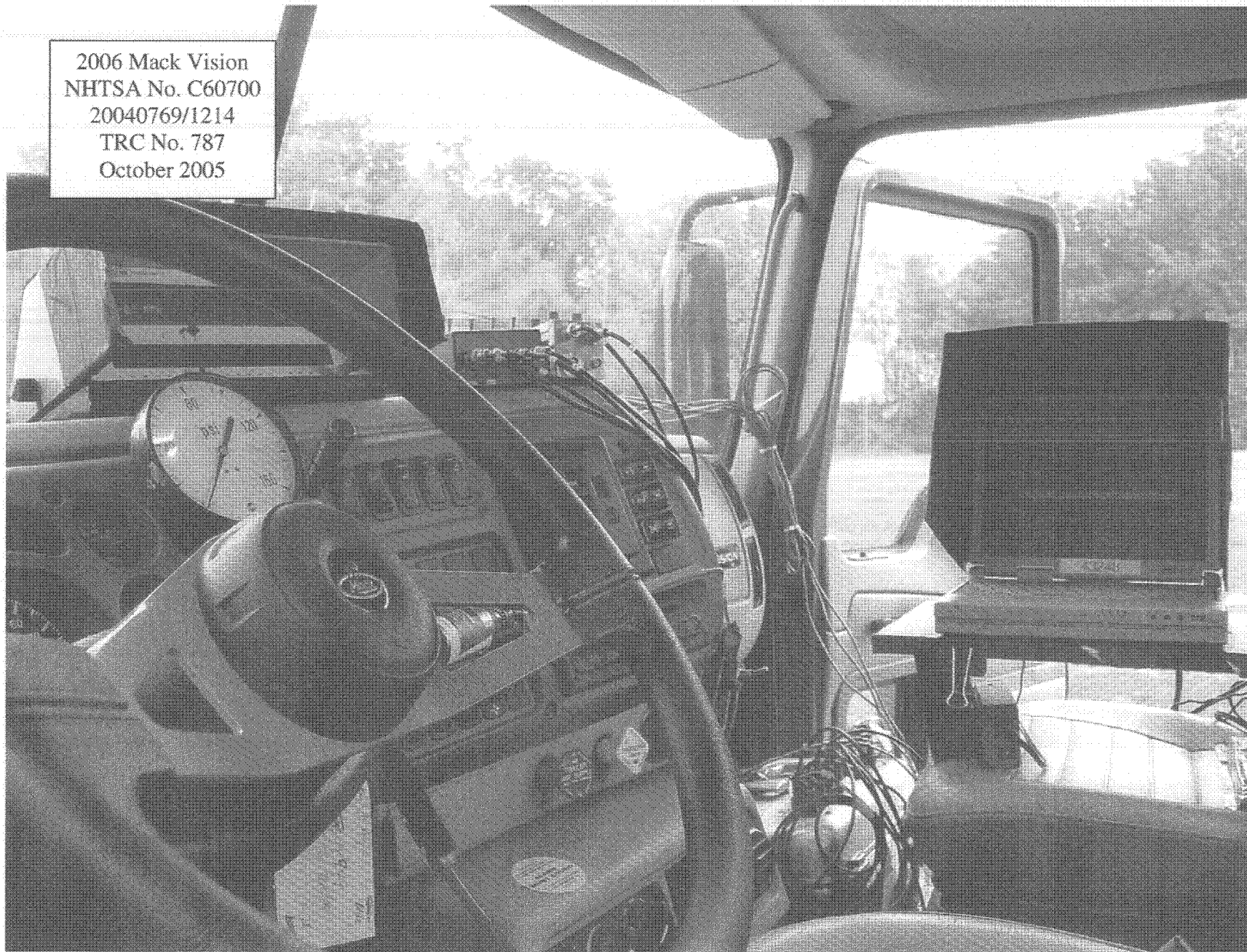
ABS Electronic Control Module

2006 Mack Vision
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Air Dryer

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



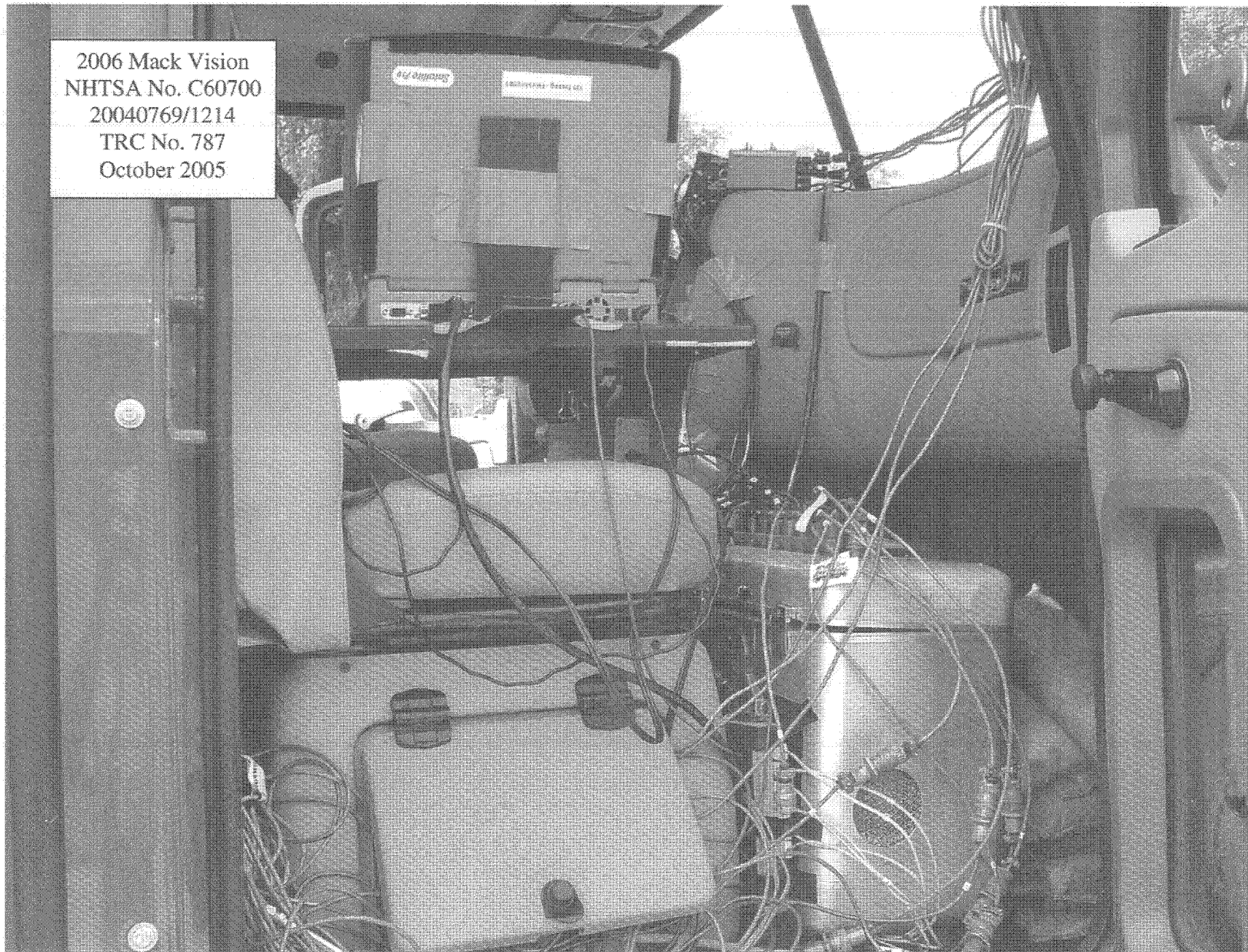
Instrumentation in Vehicle #1

2006 Mack Vision
NHTSA No. C60700
20040769/1214
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October 2005



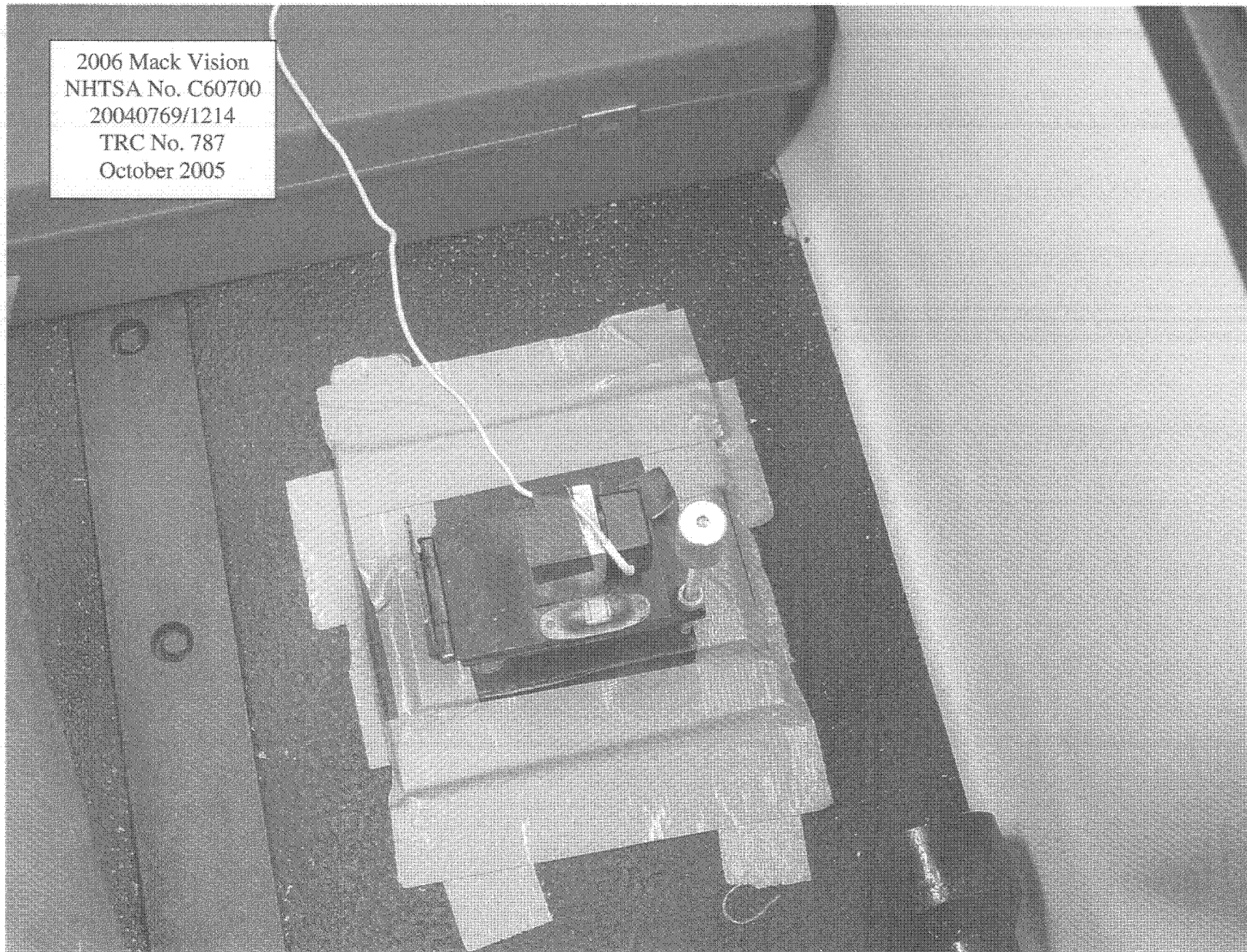
Instrumentation in Vehicle #2

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



Instrumentation in Vehicle #3

2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005

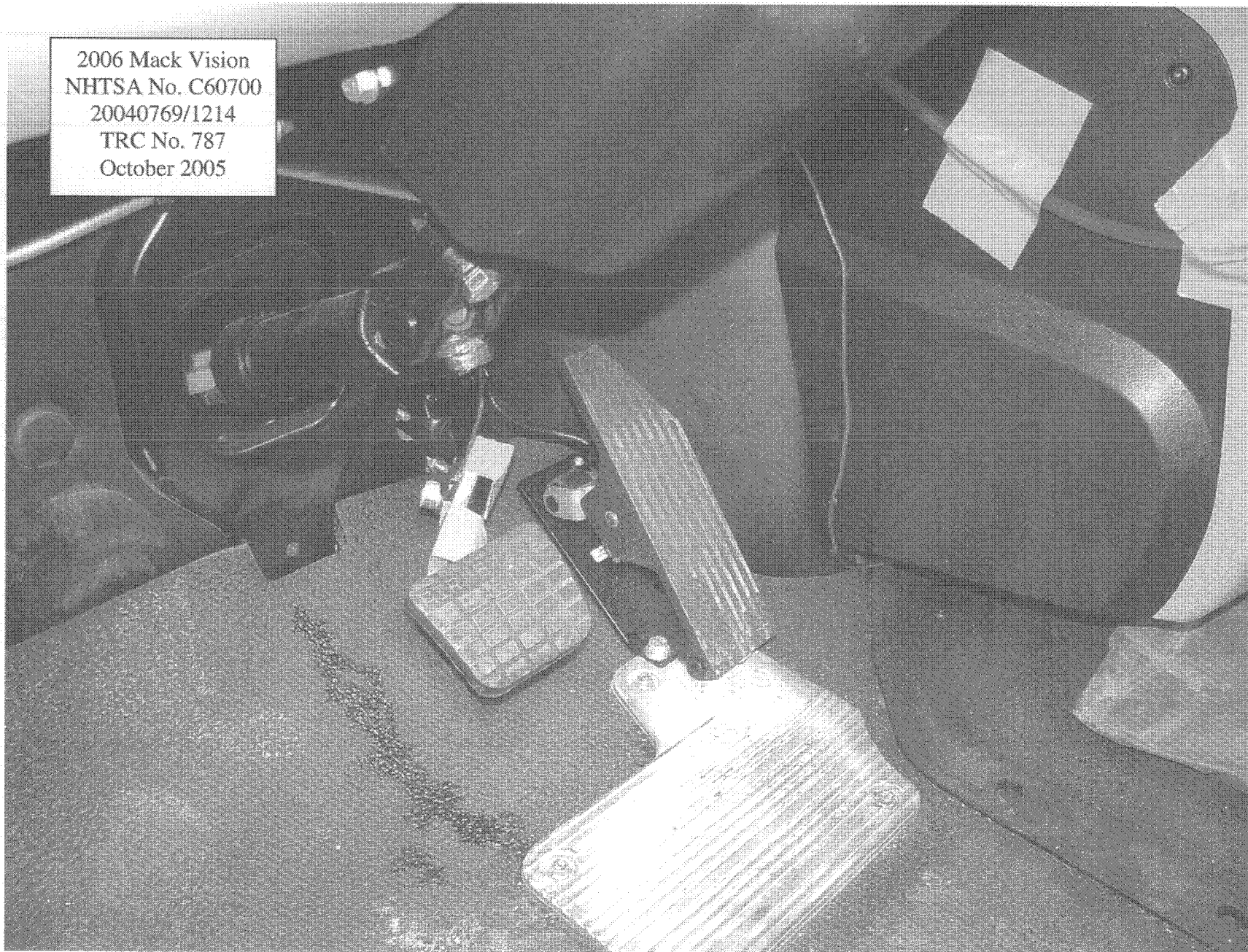


Instrumentation in Vehicle - Decelerometer

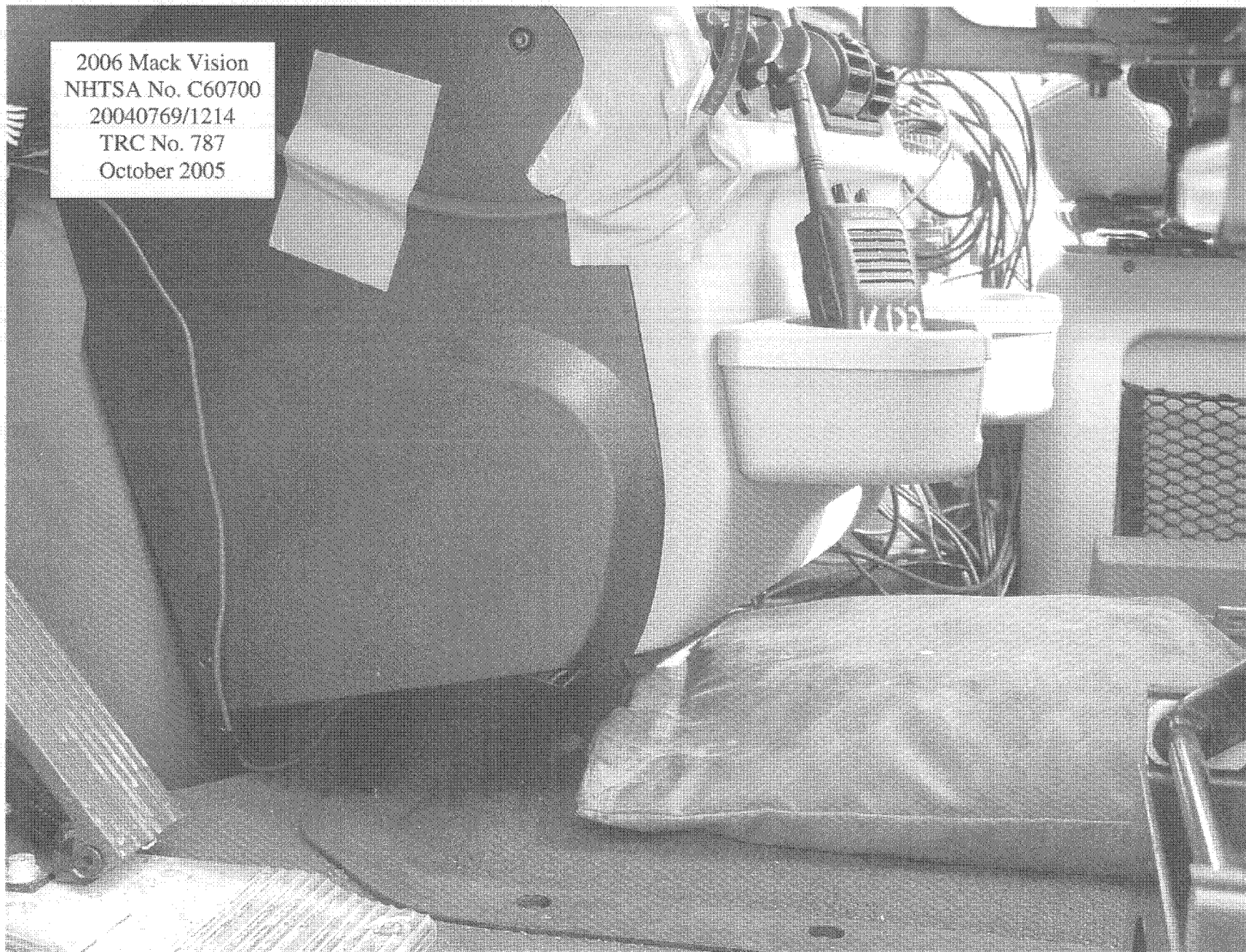
2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005

Instrumentation in Vehicle – Speed Sensor

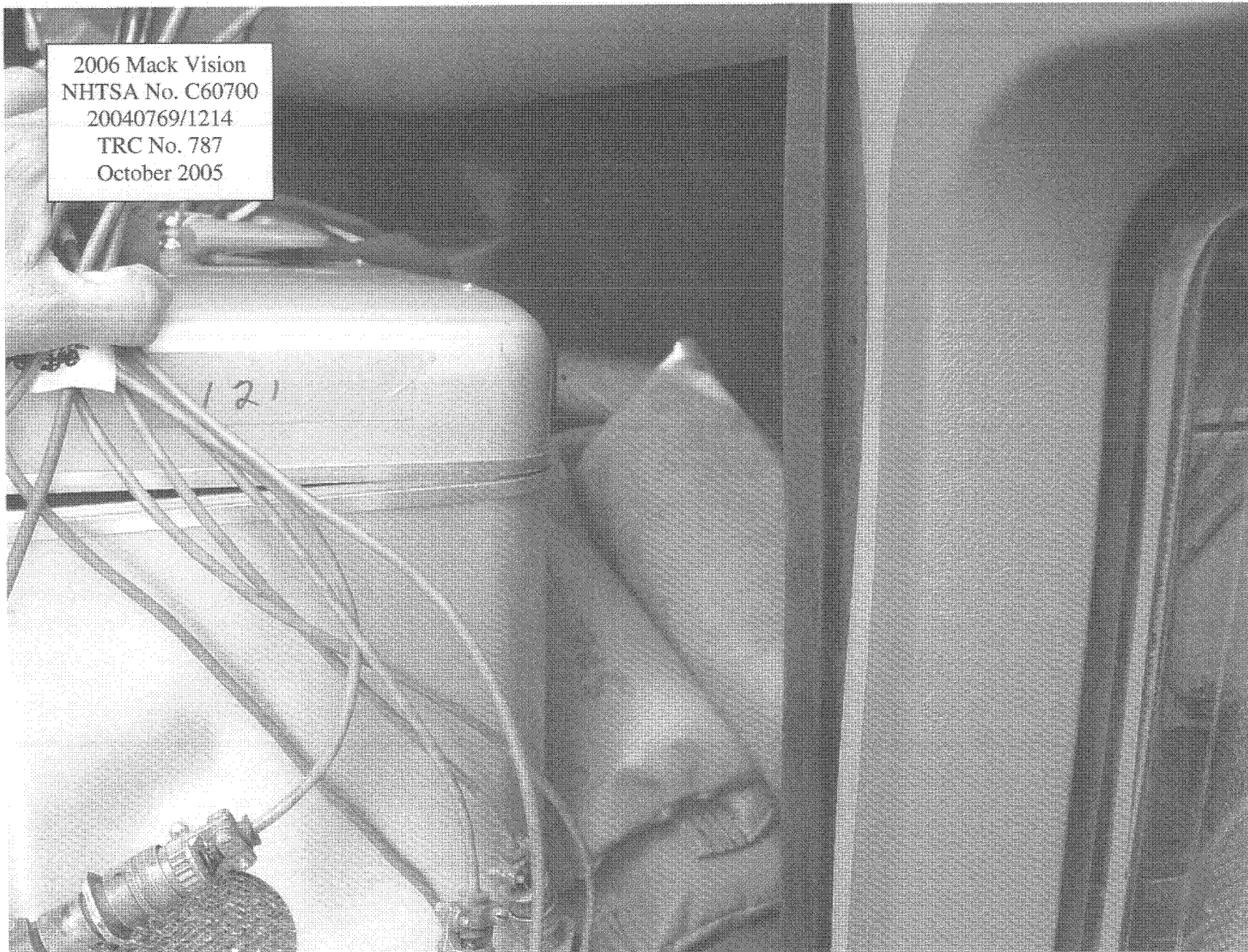
2006 Mack Vision
NHTSA No. C60700
20040769/1214
TRC No. 787
October 2005



Instrumentation in Vehicle – Accelerometer on Brake Pedal



Ballast in Vehicle #1



Ballast in Vehicle #2

APPENDIX B

TEST DATA FROM REPORT GENERATOR

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/04/05

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0030, 10/04/05, 16:09:42

Weather Conditions: 67°F Wind: 1 mph 141°

Start Odo.: 701

End Odo.: 1206

Schedule:

Initial Brake Temperature Less Than 200°F

Initial Speed 40 mph to 20 mph

500 snubs with transmission in gear

Performance Requirements:

Interval between runs: Time necessary to reach speed of 40 mph and 1 mile, or 1.5 miles, whichever occurs first.

Constant decel rate: 10 ft/sec²

Pedal force adjusted to maintain constant decel.

No Lock-Up allowed longer than 0.1 sec above 10 mph

Vehicle Must stay in lane of 12 ft.

SNUB #	INIT	LEFT FRONT	RIGHT FRONT	LTAG AXLE	RTAG AXLE	LEFT IBT	RIGHT IBT	AVG. PEDAL	AVG. DECEL
	SPD (mph)	IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)	PRESSURE (psi)	(ft/sec ²)
1	38.28	115	113	147	147	154	152	35.30	8.01
25	40.02	296	309	390	373	433	451	28.74	4.91
50	39.58	262	278	442	438	512	560	52.34	9.80
75	39.75	254	273	441	452	522	579	51.44	10.48
100	40.19	254	269	446	461	529	584	40.34	8.62
125	39.71	253	264	449	466	538	577	50.65	10.36
150	39.91	242	253	383	393	443	468	49.57	10.39
175	39.87	256	267	448	460	530	552	48.13	10.22
200	39.95	251	263	467	486	555	567	49.83	10.48
225	39.51	256	274	476	500	566	570	52.21	10.90
250	40.62	248	266	478	502	558	560	47.42	10.31
275	39.87	244	259	338	359	376	398	43.79	9.84
300	40.32	243	265	432	466	505	527	44.28	10.24
325	40.52	248	263	456	491	537	549	39.03	9.55
350	40.49	255	268	420	457	498	525	37.93	9.58
375	40.82	256	272	463	504	549	557	41.66	9.58
400	40.34	257	267	401	433	462	478	38.62	9.99
425	40.71	269	285	474	516	548	561	41.84	9.47
450	39.49	228	226	351	375	395	406	43.25	10.19
475	40.08	239	258	435	466	509	525	47.38	10.77
500	40.15	223	245	465	490	533	536	47.37	10.66

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/12/05

DATA SHEET 11 - STABILITY AND CONTROL AT GVWR

Testing Conditions: INV DATA, Section 0035, 10/12/05, 14:35:16

Weather Conditions: 63°F Wind: 4 mph 152°

Start Odo.: 1252

End Odo.: 1256

Schedule:

Initial Brake Temperature <200 F

Initial Speed <=40 mph

4 stops with transmission in neutral

Performance Requirements:

Three Stops with:

Highest possible constant speed at which vehicle
can be driven through 200 feet of arc of low

Mu 500 ft radius curve.

Vehicle Must stay in lane of 12 feet

STOP	INIT	LEFT	RIGHT	LTAG	RTAG	LEFT	RIGHT	ACTUAL	CORRECTED	MAX.	AVG.	MAX.	AVG.
#	SPD	FRONT	FRONT	AXLE	AXLE	REAR	REAR	DISTANCE	DISTANCE	PEDAL	PEDAL	DECEL	DECEL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(feet)	(feet)	(psi)	(psi)	(ft/sec²)	(ft/sec²)
1	23.43	109	110	176	173	178	163	106.0	156.8	91.41	58.57	15.24	6.94
2	23.16	113	117	177	176	180	167	109.2	165.4	80.93	61.52	17.07	6.86
3	23.20	120	125	179	182	184	172	108.6	163.9	74.37	57.07	16.45	6.99
4	23.42	126	133	182	186	184	175	105.5	156.2	90.87	62.61	16.35	7.03
5	23.47	133	140	184	187	186	179	114.6	168.9	81.76	61.43	18.28	6.73

STOP	DRIVER VEHICLE STOP COMMENTS			
#	(Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	CAMERA BATTERY FAILED DURING STOP.			
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKIKNS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/13/05

DATA SHEET 11A - STABILITY AND CONTROL AT LLVW

Testing Conditions: INV DATA, Section 0040, 10/13/05, 09:09:31

Weather Conditions: 57°F Wind: 1 mph 302°

Start Odo.: 1260

End Odo.: 1264

Schedule:

Initial Brake Temperature <200 F

Initial Speed <=40 mph LLVW

4 stops with transmission in neutral

Performance Requirements:

Three Stops with:

Highest possible constant speed at which vehicle
can be driven through 200 feet of arc of low
Mu 500 ft radius curve.

Vehicle Must stay in lane of 12 feet

STOP	INIT	LEFT	RIGHT	LTAG	RTAG	LEFT	RIGHT	ACTUAL	CORRECTED	MAX.	AVG.	MAX.	AVG.
#	SPD	FRONT	FRONT	AXLE	AXLE	REAR	REAR	DISTANCE	DISTANCE	PEDAL	PEDAL	DECEL	DECEL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(feet)	(feet)	(psi)	(psi)	(ft/sec²)	(ft/sec²)
1	24.49	106	113	146	147	154	143	103.5	155.4	73.29	59.94	23.65	6.97
2	24.64	124	135	167	158	169	154	106.1	157.3	76.49	58.98	19.18	6.18
3	25.40	121	130	150	147	152	143	111.8	155.9	101.99	62.07	20.88	6.79
4	23.64	140	153	170	167	166	158	96.4	155.4	104.08	57.90	25.97	6.48

STOP	DRIVER VEHICLE STOP COMMENTS			
#	(Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/13/05

DATA SHEET 12 - SERVICE BRAKE STOPPING DISTANCE AT GVWR

Testing Conditions: INV DATA, Section 0045, 10/13/05, 10:46:15

Weather Conditions: 66°F Wind: 1 mph 312°

Start Odo: 1270

End Odo: 1295

Schedule:

Initial Brake Temperature: <200°F

Initial Speed: 60 mph, or, if unattainable,
a speed multiple of 5.

6 stops with transmission in gear

Performance Requirements:

One Stop with:

Stopping Distance less than: 355.0 feet

(See Table 1 of FMVSS121, "Stopping Distance Requirements")

Lock-Up allowed no longer than 1 sec above 20 mph on 1 wheel

Vehicle Must stay in lane of 12 ft.

STOP	INIT	LEFT	RIGHT	LTAG	RTAG	LEFT	RIGHT	ACTUAL	CORRECTED	MAX.	AVG.	MAX.	AVG.
#	SPD	FRONT	FRONT	AXLE	AXLE	REAR	REAR	DISTANCE	(SAE 299)	PEDAL	PEDAL	DECEL	DECEL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(feet)	(feet)	(psi)	(psi)	(ft/sec²)	(ft/sec²)
1	60.54	136	135	189	193	192	176	319.2	313.5	107.85	98.07	22.90	12.48
2	59.53	116	115	177	185	195	190	291.5	296.1	99.06	94.97	29.70	13.66
3	59.99	115	114	167	178	191	193	303.4	303.6	102.03	93.53	23.58	13.35
4	59.85	106	106	167	172	193	194	298.5	300.0	100.65	93.21	27.50	13.42
5	59.70	100	102	151	157	163	161	290.0	293.0	108.06	99.68	26.91	13.90
6	59.82	123	125	172	176	194	193	288.8	290.5	106.57	98.03	23.64	14.19

STOP	DRIVER VEHICLE STOP COMMENTS		
#	(Wheel Lock up - Direction of Stop - Stay in Lane)		
1	-	NOX	SOUTH YES
2	-	NOX	SOUTH YES
3	-	NOX	SOUTH YES
4	-	NOX	SOUTH YES
5	-	NOX	SOUTH YES
6	-	NOX	SOUTH YES

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/06/05

DATA SHEET 121 - PARKING BRAKE CHAMBER APPLICATION PRESSURE

Testing Conditions: INV DATA, Section 0058, 10/06/05, 15:37:03

Schedule:

Pressurize primary and secondary reservoirs to 100 PSI
Transducers on LF and RR park brake chambers

Performance Requirements:

One Test with:

LF and RR Pressures after actuation

Time of 3 Seconds.

Value to be used in the Grade-holding park brake test

If pressures <3 psi, use value of 0 psi.

Test #	INITIAL MAIN (psi)	INITIAL LF (psi)	INITIAL RR (psi)	LF	RR
				3 SECOND DELAY (psi)	3 SECOND DELAY (psi)
1	100.01	100.27	100.54	0.43	0.48
2	100.16	100.00	100.37	0.19	0.26
3	100.17	100.07	100.43	0.10	0.20
4	100.13	99.94	100.40	0.40	0.30
5	100.52	100.38	100.70	-0.03	-0.07
6	100.70	100.53	100.83	0.17	0.26

STOP

DRIVER VEHICLE STOP COMMENTS

(Wheel Lock-Up - Direction of Stop - Stay in Lane)

1 INTERMEDIATE AXLE
2 INTERMEDIATE AXLE
3 INTERMEDIATE AXLE
4 REAR AXLE
5 REAR AXLE
6 REAR AXLE

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK
Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/17/05

DATA SHEET 16 - SERVICE BRAKE STOPPING DISTANCE AT LLVW

Testing Conditions: INV DATA, Section 0046, 10/17/05, 09:51:49

Weather Conditions: 51°F Wind: 5 mph 150°

Start Odo: 1318

End Odo: 1331

Schedule:

Initial Brake Temperature: <200°F

Initial Speed: 60 mph, or, if unattainable,
a speed multiple of 5.

6 stops with transmission in gear

Performance Requirements:

One Stop with:

Stopping Distance less than: 335.0 feet

(See Table 1 of FMVSS121, "Stopping Distance Requirements")

Lock-Up allowed no longer than 1 sec above 20 mph on 1 wheel

Vehicle Must stay in lane of 12 ft.

STOP #	INIT SPD (mph)	LEFT FRONT	RIGHT FRONT	LTAG AXLE	RTAG AXLE	LEFT REAR	RIGHT REAR	ACTUAL DISTANCE (feet)	CORRECTED DISTANCE (SAB 299) (feet)	MAX. PEDAL PRESSURE (psi)	AVG. PEDAL PRESSURE (psi)	MAX. DECEL (ft/sec ²)	AVG. DECEL (ft/sec ²)
		IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)	IBT (°F)						
1	59.28	89	89	141	138	140	127	239.4	245.3	124.82	100.77	46.61	16.55
2	59.52	151	155	169	162	172	158	234.1	237.9	111.30	93.56	38.49	16.07
3	59.22	149	153	173	163	178	165	221.5	227.3	113.80	91.63	54.81	17.13
4	60.15	172	175	161	159	171	160	227.3	226.1	113.93	86.83	40.04	17.07
5	59.27	186	185	162	153	169	159	219.9	225.4	113.76	85.54	39.58	16.93
6	59.36	180	181	156	146	167	157	217.6	222.3	112.24	82.88	53.23	16.93

STOP # DRIVER VEHICLE STOP COMMENTS
(Wheel Lock up - Direction of Stop - Stay in Lane)

STOP #	DRIVER	VEHICLE	STOP COMMENTS
1	-	NOX	SOUTH YES
2	-	NOX	SOUTH YES
3	-	NOX	SOUTH YES
4	-	NOX	SOUTH YES
5	-	NOX	SOUTH YES
6	-	NOX	SOUTH YES

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK
Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/17/05

DATA SHEET 17 - EMERGENCY BRAKE STOPPING DISTANCE AT LLVW Primary Reservoir Failure

Testing Conditions: INV DATA, Section 0053, 10/17/05, 11:52:29

Weather Conditions: 60°F Wind: 8 mph 207°

Start Odo: 1334

End Odo: 1346

Schedule:

Initial Brake Temperature: <200°F

Initial Speed: 60 mph, or, if unattainable,
a speed multiple of 5.

6 stops with transmission in gear

Performance Requirements:

One Stop with:

Stopping Distance less than: 720.0 feet

(See Table 1 of FMVSS121, "Stopping Distance Requirements")

Lock-Up allowed no longer than 1 sec above 20 mph on 1 wheel

Vehicle Must stay in lane of 12 ft.

STOP	INIT	LEFT	RIGHT	LTAG	RTAG	LEFT	RIGHT	ACTUAL	CORRECTED	MAX.	AVG.	MAX.	AVG.
#	SPD	FRONT	FRONT	AXLE	AXLE	REAR	REAR	DISTANCE	(SAE 299)	PEDAL	PEDAL	DECEL	DECEL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(feet)	(feet)	(psi)	(psi)	(ft/sec ²)	(ft/sec ²)
1	57.96	177	175	96	93	100	98	373.6	400.4	57.30	42.80	20.58	10.11
2	58.28	193	184	100	97	104	102	310.8	329.5	58.30	45.76	28.97	11.96
3	58.43	169	183	84	84	86	86	355.4	374.8	60.10	47.18	20.76	10.66
4	59.20	195	177	90	91	94	91	317.1	325.7	57.38	44.98	22.28	11.73
5	65.46	185	171	92	93	97	93	463.7	389.5	57.05	42.34	22.75	9.62
6	58.40	191	170	99	98	100	97	372.3	392.9	54.36	43.31	21.31	9.90

STOP DRIVER VEHICLE STOP COMMENTS
(Wheel Lock up - Direction of Stop - Stay in Lane)

STOP	DRIVER	VEHICLE	STOP	COMMENTS
#				
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/17/05

DATA SHEET 18 - EMERGENCY BRAKE SECONDARY STOPPING DISTANCE AT LLVW Secondary Reservoir Failure

Testing Conditions: INV DATA, Section 0054, 10/17/05, 14:01:55

Weather Conditions: 62°F Wind: 7 mph 191°

Start Odo: 1347

End Odo: 1355

Schedule:

Initial Brake Temperature: <200°F

Initial Speed: 60 mph, or, if unattainable,
a speed multiple of 5.

6 stops with transmission in gear

Performance Requirements:

One Stop with:

Stopping Distance less than: 720.0 feet

(See Table 1 of FMVSS121, "Stopping Distance Requirements")

Lock-Up allowed no longer than 1 sec above 20 mph on 1 wheel

Vehicle Must stay in lane of 12 ft.

STOP #	INIT SPD	LEPT FRONT	RIGHT FRONT	LTAG IBT	RTAG IBT	LBFT IBT	RIGHT IBT	ACTUAL DISTANCE	CORRECTED DISTANCE	MAX. PEDAL PRESSURE	AVG. PEDAL PRESSURE	MAX. DECEL	AVG. DECEL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)						
1	59.86	168	165	97	98	100	97	309.3	310.7	81.50	68.32	28.22	12.95
2	58.82	186	183	111	114	115	109	318.9	331.8	78.85	62.01	21.00	12.05
3	59.56	186	177	116	116	121	113	359.4	364.8	77.91	59.21	29.24	11.13
4	59.40	190	183	121	124	128	121	335.3	342.1	74.51	61.69	21.98	11.76
5	60.36	190	181	124	127	130	124	353.4	349.1	79.05	59.67	21.70	11.51
6	60.42	184	175	128	130	134	127	358.7	353.7	78.80	55.61	27.57	11.00

STOP DRIVER VEHICLE STOP COMMENTS
(Wheel Lock up - Direction of Stop - Stay in Lane)

1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BRAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/17/05

DATA SHEET 19 - EMERGENCY BRAKE CONTROL LINE FAILURE DISTANCE @LLVW Control Line Failure

Testing Conditions: INV DATA, Section 0055, 10/17/05, 14:48:27

Weather Conditions: 65°F Wind: 10 mph 196°

Start Odo: 1355

End Odo: 1361

Schedule:

Initial Brake Temperature: <200°F

Initial Speed: 60 mph, or, if unattainable,
a speed multiple of 5.

6 stops with transmission in gear

Performance Requirements:

One Stop with:

Stopping Distance less than: 720.0 feet

(See Table 1 of FMVSS121, "Stopping Distance Requirements")

Lock-Up allowed no longer than 1 sec above 20 mph on 1 wheel

Vehicle Must stay in lane of 12 ft.

STOP	INIT	LEFT	RIGHT	LTAG	RTAG	LEFT	RIGHT	ACTUAL	CORRECTED	MAX.	AVG.	MAX.	AVG.
#	SPD	FRONT	FRONT	AXLE	AXLE	REAR	REAR	DISTANCE	DISTANCE	PEDAL	PEDAL	DECBL	DECBL
	(mph)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(feet)	(SAE 299)	PRESSURE	PRESSURE	(ft/sec ²)	(ft/sec ²)
1	59.72	188	183	133	133	139	131	256.5	258.9	79.66	47.30	33.39	15.01
2	59.38	186	174	136	130	142	132	269.0	274.6	52.81	41.13	27.59	14.58
3	59.42	178	165	136	126	145	135	277.3	282.7	50.19	36.41	28.18	13.84
4	59.24	193	184	150	134	159	148	269.8	276.8	57.70	37.40	49.77	14.06
5	58.86	177	162	147	127	153	142	254.1	264.1	70.74	42.22	47.86	14.33
6	59.24	181	167	150	127	156	146	267.7	274.7	50.32	37.59	34.65	13.63

STOP DRIVER VEHICLE STOP COMMENTS
(Wheel Lock up - Direction of Stop - Stay in Lane)

1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK
Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/13/05

DATA SHEET 20 - PARKING BRAKE TEST (GRADE HOLDING) AT GVWR

Testing Conditions: INV DATA, Section 0065, 10/13/05, 14:10:30

Parking brake: N/A

Non-service type: N/A

Service type: HAND-OPERATED

Weather Conditions: 67°F

Wind: 3 mph 67°

Start Odo.: 1297

End Odo.: 1297

Test Weight: Total:50960lbs

Front:11980lbs

Rear:38980lbs

Schedule:

Initial Brake Temperature <200°F or (Ambient temp.
if non-service brake type materials)

Loaded to GVWR with transmission in neutral

Drive onto 20% slope in forward and reverse directions.

Performance Requirements:

Up to Three Applies in each direction:

Parking brake must hold the vehicle stationary
in both directions for 5 minutes each.

NOTE: For vehicles with parking brake systems not utilizing the service brake friction elements, the friction elements of such systems are to be burnished prior to parking brake tests according to the manufacturer's published recommendation as furnished to the purchaser. If no recommendations are furnished, test the system in an unburnished condition. If recommendations are furnished, record method used.

APPLY #	MAX SERVICE FORCE (psi)	MAX P-BRAKE FORCE (psi)	LEFT REAR IBT (°F)	RIGHT REAR IBT (°F)	AVG REAR IBT (°F)	DRIVER VEHICLE STOP COMMENTS (Direction of Stop (Up/Down) - Brake holds/fails)			
1	49.3	0.1	161	165	163.0	0 REAPPLY	UPHILL	HOLDS	20%
2	46.2	0.1	163	166	164.5	0 REAPPLY	DOWNHILL	HOLDS	20%

Is brake system indicator lamp activated: YES (X) NO ()

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BRAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

Vehicle: 2006 MACK TRUCKS INC NHTSA NUMBER: C60700

Make: MACK

Model: VISION

Body Style: DAY CAB

Front Cold Tire Pressure: 120 (PSI)

Rear Cold Tire Pressure: 105 (PSI)

Transportation Research Center, Inc.

10820 State Route 347

East Liberty, Ohio 43319

Date Tested: 10/18/05

DATA SHEET 21 - PARKING BRAKE TEST (GRADE HOLDING) AT LLVW

Testing Conditions: INV DATA, Section 0066, 10/18/05, 09:50:58

Parking brake: N/A

Non-service type: N/A

Service type: HAND-OPERATED

Weather Conditions: 58°F Wind: 7 mph 292°

Start Odo.: 1368

End Odo.: 1368

Test Weight: Total: 50960lbs

Front: 11980lbs

Rear: 38980lbs

Schedule:

Initial Brake Temperature <200°F or (Ambient temp.
if non-service brake type materials)

Loaded to GVWR with transmission in neutral

Drive onto 20% slope in forward and reverse directions.

Performance Requirements:

Up to Three Applies in each direction:

Parking brake must hold the vehicle stationary

in both directions for 5 minutes each.

NOTE: For vehicles with parking brake systems not utilizing the service brake friction elements, the friction elements of such systems are to be burnished prior to parking brake tests according to the manufacturer's published recommendation as furnished to the purchaser. If no recommendations are furnished, test the system in an unburnished condition. If recommendations are furnished, record method used.

	MAX SERVICE FORCE (psi)	MAX P-BRAKE FORCE (psi)	LEFT REAR IBT (°F)	RIGHT REAR IBT (°F)	AVG REAR IBT (°F)	DRIVER VEHICLE STOP COMMENTS (Direction of Stop (Up/Down) - Brake holds/fails)			
APPLY #									
1	24.2	0.4	193	193	193.0	-	0 REAPPLY	UPHILL	HOLDS 20%
2	30.9	0.4	159	160	159.5	-	0 REAPPLY	DOWNHILL	HOLDS 20%

Is brake system indicator lamp activated: YES (X) NO ()

DATA INDICATES COMPLIANCE: YES (X) NO ()

Driver: KAREN EASTERDAY

Observer: BRAD BEAN

Recorded Data Processed by: CHUCK JENKINS

Date: 10/20/05

Approving Laboratory Official: KEN WEBSTER

Date: 11/01/05

APPENDIX C

CONTRACTOR'S COMMENTS

For Vehicle #787/C60700:

The vehicle tested was a new model truck tractor that had not been in service prior to delivery to TRC for testing. All components of the braking system were found to within manufacturer's specifications prior to test start and no adjustments were necessary through the entirety of the test.

To accommodate installation of the anti-jackknife brackets the aluminum walkway located on the frame rails behind the cab were removed during the test. These components were reinstalled at the conclusion of the test series.

During the incoming inspection the outer dual tire on the right side rear axle was found to have a tire plug installed. During periodic tire pressure checks throughout the testing there was no leak present.

The vehicle passed the Parking Brake Hill Hold Test at both GVWR and LLVW and therefore the Static Retardation Force Test was not performed.

The complete GVWR rating was not achieved on this vehicle, as the weight could not be adjusted so that none of the axles exceeded their GAWR. The total test weight was reduced to eliminate exceeding any GAWR but remained within the tolerance level specified in the Laboratory Test Procedure.